RAILROAD GAZETTE

FRIDAY, OCTOBER 5, 1900.

CONTENTS

Contributions

The Relative Economy of Stationary and Locomotive Steam Plants.

New York, Sept. 8, 1900.

To the Editor of the Railroad Gazette.

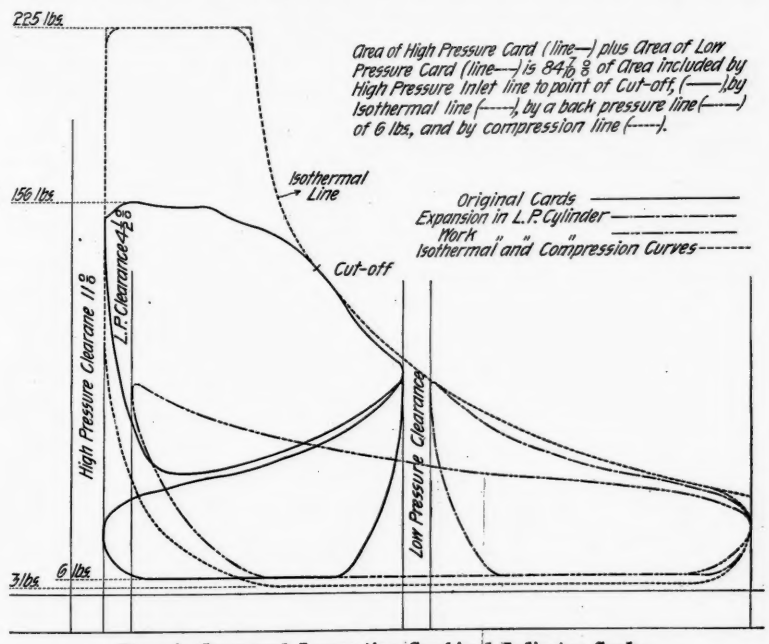
I note with interest the letter of J. A. Powers in the *Railroad Gazette* of Sept. 7, and your editorial comments thereon, and as I have given considerable attention to both sides of the question involved, I should like to ask some questions in connection with Mr. Powers' letter and your editorial conclusions.

First, as to Mr. Powers' conclusion that a locomotive would not be found capable of developing 1,000 h.p. continuously. Why? If she will develop from 1,800 to 2,500 h.p. at full speed on a level and continue to do so for one hour, why not for ten hours if the track is long enough, the coal and water supply holds out and the man behind the shovel is capable of supplying the furnace and keeping his fire or fires in condition for continuous work? As we have authentic records of 1,800 h.p. having been developed for three or more hours, we are confident that it can be done for any reasonable time. We will admit that some of the modern locomotives of ordinary design have reached a point where the capacity of one man to keep them properly supplied with coal has more than been reached, and such large quantities of coal are consumed that one tankful does not cover a very long distance or a very long period of time; but we are fully convinced that these exceptionally large locomotives, having from 2,500 to 3,000 sq. ft. of heating surface and with the same grate area as engines of one-half the heating surface, are a great mistake, and that high pressure locomotives with 22 x 28 in. cylinders and carrying 200 to 225 lbs. pressure, are a greater mistake. Such engines are and must necessarily be very wasteful of fuel and beyond the capacity of men constructed on ordinary lines to either fire them or properly handle them, and, what is worse, they do not perform the work on fast and heavy trains any better than the lighter engines. These, however, are mistakes of designers and builders in trying to achieve a much desired result, in the wrong way and do not in the least detract, from the possibilities of the locomotive as a machine.

As to your editorial comments, first, as to wide variations of load. I think if you will examine the work required of a locomotive in pulling such a train as the Southwestern Limited on the New York Central & Hudson River or any of the fast and heavy trains between New York and Philadelphia, on either the Pennsylvania or the Reading Railroad, you will find that the work is so constant that the injector is set and not stopped or started over the division, and that on local trains lighter locomotives are used, and the schedule so made as to get out all there is in that particular class of engine, so that they are worked up to their full capacity, and that generally speaking all locomotives, either in freight or passenger service, are overloaded, and the question of obtaining greater capacity is one that interests railroad men more to-day than any other question connected with motive power departments, hence the attempts to secure greater capacity and the failures of the very large locomotives mentioned above, and we may conclude that the loads of locomotives, when designed for a particular class of service, do not widely vary. This is the case with stationary engines in electrical work, and especially so with those driving cross-country lines.

Now, as to the question of coal consumption. You give four to seven pounds as the amount of coal required for simple locomotives of the ordinary type. This, I think, is low, if we consider the quantity of coal required by some of the modern monsters mentioned above, which, for heavy, fast express work, require 5,000 to 6,000 lbs. of coal per hour while developing an average of 800 to 900 h.p., or about 6½ lbs. of coal per hour per horse-power developed, and we have records of freight locomotives consuming 11,000 to 13,000 lbs. per hour, and not developing any greater horse-power, making the coal consumed 12 to 13 lbs. per horse-power developed. As stated above, this is not necessary or desirable. As to the 3 to 5 lbs. required for non-condensing, stationary work, this is a fair average, but can be very much improved on, just as the locomotive has been and can be improved upon.

Now, as to the amount of fuel required for a properly designed compound locomotive, we would ask why you allow 4 lbs. of coal as being necessary, how much water you allow per horse-power hour, and what evaporation per pound of coal. We assume that you allow 24 lbs. of water per horse-power hour, and that you figure on 6 lbs. evaporation. As showing that such amounts are not necessary in a properly designed compound, I inclose blue-print of combined indicator card showing two conditions; one in actual service when the boiler pressure was 156, which showed 18.7 and low pressure card showed 18.3; the third card, by carrying the pressure up to 225 would show 16.3. It will be observed that at the comparatively slow speed of 160 revolutions and 32.1 miles, this engine indicated 1,056.6 h.p. If we allow that the actual water consumption was 10 per cent. more than that accounted for by the card, we have respectively 20.50, 20.13 and 17.93.



Strong's Compound Locomotive Combined Indicator Cards.

Pounds of steam per 1 h. p. from cards: H. P. card less than 18.7; L. P. card less than 18.3; Isotherm. card less than 16.3.

Now, as to evaporation, the evaporation of the boiler on this class of locomotives, when worked above 900 h.p., with a heating surface of 1,848 sq. ft., from and at 212 deg. was, according to Mr. Leavitt's tests on the Lehigh Valley R. R., 9.85 lbs. of water per pound of coal, and in more recent designs in which we have 3,150 sq. ft. of heating surface and 72 sq. ft. of grate area, we expect even better results, and shall not be surprised to get 11 lbs. of water evaporated per pound of good coal, as the water will enter the boiler at 235 deg. by the utilization of waste products which are now thrown away.

It will be seen from the above that, with a properly designed compound locomotive, a horse-power can be secured for less than 2 lbs. of coal, and that such an engine can be designed to give 2,000 h.p. continuously while giving these results, and will cost but very little more than you have allowed for a 1,000 h.p. compound. Where, then, will your stationary plant be, if required to compete with a 2,000 h.p. locomotive instead of with one of 1,000 h.p.?

Geo. S. Strong.

Locomotive Appliance Company,
Chicago, September 11, 1900.

To the Editor of the Railroad Gazette.

I have been very much interested in the editorial, page 596, issue of Sept. 7, under the caption: "The Relative Economy of Stationary and Locomotive Steam Plants." It seems to your subscriber that in view of the fact that the heat in the steam being the vital force in the steam, highest ultimate economy is obtainable where you use the least volume of steam in the least period of time, admitting this steam to the engine cylinder at the boiler pressure and through a properly designed valve movement, exhaust the steam from the cylinder at as near atmospheric pressure as possible; and by this "possible" is not meant the limitations of some particular valve movement, but it means that the valve movement must be designed so that the use of the expansive force of the steam approaches most nearly to the ideal. The valve movement must also be so designed that in opening the ports for the admission of steam to the cylinder, the steam flows freely into the cylinder and is not required to expend any portion of its force in passing through the ports, so that the steam line shall be parallel to the atmospheric line that no loss in the mean effective pressure results here. At point of cut-off the valve movement must be such as to give a sharp, decided closing of the port to avoid exactly the same evil as just mentioned. The valve movement must be such as to retain the steam in the cylinder until the full expansive force has been utilized in producing energy. Then under the influence of the valve movement the same must be allowed to pass quickly from the cylinder and necessarily the exhaust passages must be such that back pressure is absent, and in closing the exhaust port, the control of the valve must be such that excessive clearance is not necessary in the cylinder to take care of a false accumulation of pressure through a faulty valve movement. A valve movement designed to give the late closing of the exhaust for compression, obviates the necessity for excessive clearance in the engine cylinder and when this excessive clearance is eliminated you have disposed of one of the greatest causes of loss in producing power that is to-day presented in engine construction, and there is no place where this loss exists to a greater extent than in the locomotive.

There are on the market to-day a number of so-called stationary automatic engines in which the excessive compression through the valve movement used, produces practically the same excessive compression as found in locomotive practice and in such stationary engines you will find the question of clearance very close to locomotive practice. With the valve movement properly designed to give the correct distribution of steam to the cylinder, it is entirely possible to build engines for any and all classes of service, stationary, locomotive, marine, etc., having high piston speed, using a minimum amount of steam, exhausting at low pressure, and with compression in legitimate bounds and with minimum clearance. Such an engine adapted to its load will give the user the indicated horse-power at the minimum fuel expense.

In your editorial you speak of locomotives developing a horse-power on from 5 to 7 lbs. of coal per horse-power per hour. If you have available any data substantiating these figures, you will confer a favor on the writer if you will please briefly publish the same. In most stationary plants a low grade of fuel is used. In locomotive practice, as a rule, screened lump coal is burned. In stationary practice, under favorable conditions, a horse-power is obtained in isolated instances on 5 lbs. of the inferior coal mentioned. Doubt has already been expressed in regard to obtaining an indicated horse-power in locomotive practice on 7 lbs. of screened lump coal.

Ira C. Hubbell.

Improvements on the Chicago & Alton.

New York, Oct. 2, 1900.

To the Editor of the Railroad Gazette.

The Chicago & Alton are making extensive improvements in every department, and when their plans have been fully carried out it will be one of the best equipped railroads running out of Chicago and St. Louis. The "Alton Limited" trains are the handsomest trains running out of Chicago. They are made up of a mail car, combined smoking car, two Chicago & Alton chair cars, cafe car with dining, buffet, library and smoking compartments, and a Pullman parlor observation car.

The inside finish of the cars is beautiful, and the exterior is finished in three shades of maroon and the locomotives are finished to match the train, and the color scheme is beautifully worked out, so that the whole train, including the locomotive, is remarkably handsome. The cars have 6-wheel trucks and the wood work and other

details represent the very finest productions of the Pullman shops.

These trains are pulled by Brooks simple locomotives, having piston valves which are elegant examples of the locomotive builder's art. The boiler pressure is 210 lbs., driving wheels 73 in. diam., cylinders 19 in. x 26 in., and the tractive power with a m. e. p. in the cylinder of 80 per cent. of the boiler pressure is 21,600 lbs. They are equipped with dynamos which furnish electric light for the head-lamp, front end lamps, and necessary lights for oiling the parts at night-time. A Boyer speed recorder is also used on each of these locomotives with a suitable connection to a registering gage placed in the cab, so that the engineman can read at any time the speed at which the train is running. The locomotives and cars are equipped with the Westinghouse high-speed brake. The locomotive tenders have a capacity of 6,000 gals. of water and 30,000 lbs. of coal.

The track is being brought up to the highest standard by the renewals of ties and rails and ballasting of the entire system.

The old and small freight cars are being rapidly destroyed and replaced by cars of greater capacity, and they have already received 6,000 freight cars of the latest design and large capacity. There remain yet to be delivered 200 100,000-lbs. capacity steel coal cars of the latest pattern. There have been received thus far this year 61 new locomotives built by the Brooks and the Baldwin Locomotive Works. The freight locomotives are of the consolidation type.

A large amount of money is to be expended on improvements at the shops at Bloomington, Ill. The entire plant is to be equipped with electric motors of the direct-current type for driving the machinery, overhead traveling cranes and transfer-tables. The total estimated cost of improvements is $350,000, which includes the cost of the electric installation, including the power-house, which is $105,000. The present Weston 45-ton traveling cranes in the locomotive erecting shop are to be placed with electrically driven cranes of much greater lifting capacity in order to be able to handle the locomotives weighing more than 100,000 lbs. The electric capacity of the power-house is to be 750 kilowatts, which permits sufficient reserve current for lighting the shops and offices and take care of any probable increase in the capacity of the shops in the future.

These improvements are being made under the personal direction of Superintendent of Motive Power C. M. Mendenhall and Mechanical Engineer Charles Lindstrom, both of whom are graduates of the Pennsylvania Railroad, and it will not be exceeding the limits of reasonable modesty to say that when their plans have been fully carried out the Chicago & Alton shops will be the most modern and best equipped in the West.

P. R. R.

Some Notes on Rail Joint Fastenings.

BY F. C. SCHMITZ, ASSOC. M. AM. SOC. C. E.

(*Continued from page 565.*)

PRESENT WHEEL LOADS.

The increase in engine and carloads in the last decade has been very great. Ten years ago the heaviest engines had 15,000 lb. wheel loads; now 22,000 lbs. is common, and in the P. B. & L. E. engine, No. 10 in the table, we have the enormous total of 225,000 lbs. on 8 drivers.

It seems to be the settled policy of motive power men to give the track all it can carry, no matter what its rigidity. In their haste to increase loads, however, they seem to have forgotten that it is impossible for the track department to keep pace with them. When the management of a railroad adopts a new standard rail, it does not signify that the whole line is at once equipped with the section. The motive power man, however, begins to figure out how much he can add to the next engine because of the presumed additional strength in track, when there may be but 1 per cent. or less of the new rail in service. The table gives a few statistics of heavy engines built since July 1, 1898:

STATISTICS OF SOME RECENT HEAVY ENGINES.

Number.	Name of Railroad.	Type.	Weights, Loaded. Drivers.	Trucks.	Tender.	Total.	Dia. of Drivers.	Rigid Wheel Base.	Total Length, Engine and Tender.	Total Height.	Grate Area.	Cylinders. Diameter.	Stroke, in.	Tank Capac. Coal, tons.	Water, gallons.
1	C., C. C. & St. L.	Consol.	165,000	20,000	110,000	295,000	56 in.	16 ft. 3 in.	63 ft. 7 in.	14 ft. 10¼ in	34 sq. ft.	22 in.	30	10	6,000
2	Vandalia.....	8-Wheel.	85,800	46,500	112,000	224,300	78 "	8 " 6 "	52 " 2½ "	15 " 4⅞ "	30 "	20 "	26	10	6,000
3	Gt. Northern.	12-Wheel.	172,000	40,750	....	....	55 "	15 "10 "	.....	.....	34 "	21 "	34	..	....
4	South. Pacific.	"	155,000	37,000	98,000	290,000	55 "	15 " 6 "	53 ft. 6½ in	14 ft. 11 in.	35 "	23 & 35 in.	32	10	4,500
5	D., L. & W....	Consol.	175,500	22,150	101,000	298,650	57 "	15 " 6 "	50 " 7 "	.....	95 "	22 in.	30	10	5,000
6	Lehigh Valley	Comp. Consol.	202,200	22,900	....	....	55 "	15 " 0 "	.....	15 ft.	90 "	18 & 30 in.	30	..	....
7	Union Ry.....	"	208,000	22,000	....	....	54 "	15 " 7 "	.....	.....	33.5 "	23 & 32 "	32	..	....
8	Illinois Centr'l	12-Wheel.	193,200	39,000	132,700	364,900	57 "	15 " 9 "	55 ft. 2¾ in	15 ft. 5 in.	37.5 "	23 in.	30	12	7 000
9	P. R. R.....	Consol.	177,000	21,000	104,000	302,000	56 "	18 " 8 "	62 "10¾"	14 " 11½ "	29.3 "	23½ in.	28	10	6,000
10	P., B. & L. E..	"	225,200	25,100	141,100	391,400	54 "	15 " 7 "	68 ft.	16 ft.	36.8 "	24 in.	32	14	7,500

Car wheel loads have advanced quite as fast and as much in proportion as engine loads. Ten years ago the 40,000-lb. capacity car was considered quite large. At the present time the Pennsylvania Railroad is operating coal cars of 110,000 lbs. capacity and the Schoen Pressed Steel Car Co. is reported as about to build some of 10,000 lbs. greater capacity. These cars give concentrated wheel loads of 20,000 lbs. In train lengths this is 4.500 lbs. per running foot.

Fortunately for the joint situation, these enormous loads are inducing stresses in bridge members that are holding in check the tendency to increase. Several bridge failures in the past few months, while none of them have been serious, have shown that, until the bridges can be rebuilt or strengthened, it is not safe to add to their burden.

That track material also is stressed beyond its limit is notorious. The P. B. & L. E. engine referred to induces a stress of 25,000 lbs. per sq. in. in a P. R. R. 60-lb. rail, 24 in. center to center of supports. The stress in an A. S. C. E. 100-lb. rail, under the same conditions would be 13,000 lbs. per sq. in. With 16,000 lbs. as the ultimate fiber stress for indefinitely repeated load of equal and opposite kind applied with shock, is it a wonder that angles fail, rail heads distort and flow and track maintenance is excessive?

The above loads are figured as being quiescent. There should be added an augment under certain conditions. This augment leads us to the very important subject of the vertical non-balance of locomotive counterweights.

In order better to understand the conditions which make engine counterbalance necessary, Fig. 19 has been inserted, showing the loads on drivers, how applied, etc.

The connecting rods, side rods, crank pins and crossheads all constitute loads applied elsewhere than at the center of revolution, consequently loads that generate a centrifugal force varying with speed. The counterweight is a necessity in overcoming this centrifugal force.

Taking the wheels in detail, numbers 1 and 3 are counterbalanced for the crank pin and side rods only and are, therefore, approximately in perfect balance. Wheel No. 2, however, revolves under entirely different conditions and must be counterbalanced for three weights, namely:

(a) Its proportion of the weight of side rods and crank pins as in wheels Nos. 1 and 3.

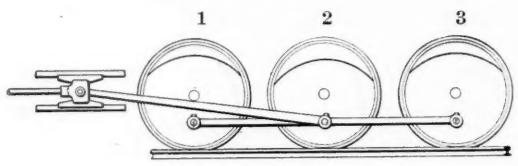


Fig. 19.

(b) One-half the weight of connecting rod, which, as in the case of side rods, is approximately a constant for a complete revolution.

(c) The weight of piston rod and cross head. This latter force is exerted in a horizontal direction only, so that the counterweight has, when in a vertical position, no weight to overcome. The result is an augment or reduction to the driver load, depending on whether the counterweight is above or below the center of revolution.

From the above the following four conditions have been evolved as controlling the revolution of wheel No. 2.

A. The mass of the wheel is held rigidly by the frame of the engine horizontally.

B. The mass of the wheel is held vertically, from above by a flexible spring, from below by a flexible track.

C. The wheel has a load on the rim opposite the crank pin to counterbalance the reciprocating parts moving horizontally.

D. Owing to the peculiar action of the reciprocating

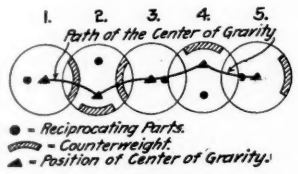


Fig. 19A.

parts the center of gravity is a moving point, its path being shown in Fig. 19-A.

It will be seen that at positions 1-3-1, the wheel is perfectly balanced and the center of gravity coincides with the center of revolution. At positions 2 and 4, however, there is an unbalanced force tending to augment and reduce the wheel load alternately.

Were the wheel perfectly free to revolve about its center of gravity, as would be a weighted disc rolled across a floor, it would not touch the rail at 2 and would be augmented at 4. In other words, the tendency would be the reverse of that shown in the figure.

It is clear, in the case of the disc, above noted, that it the floor could be raised at 2 and depressed at 4, equal to the distance between the center of gravity and center of symmetry, there would be no change in the pressure during an entire revolution. This is also true in the case of a wheel, revolving or rolling about a point not its center of gravity, except that the irregularities in the bearing should be in reverse order.

As stated under B an engine driver is held flexibly in a vertical direction by spring and rail. Therefore, could the springs above and the track beneath immediately deflect a space equal to the distance between center of revolution and center of gravity, there would be no additional pressure due to the vertical non-balance of counter-weights. Any figures based on a rigid support from below or resistance from above are, consequently, in error, as are any experiments not carried on under working conditions. The tests made at the Purdue University, with an engine mounted on friction wheels, are for that reason entirely unreliable. Under actual track conditions it is not possible to lift an engine driver from the rail.

Owing to the great variation in the depression of different points of a rail under the passage of a wheel, it is not possible to accurately calculate the effect of flexibility on the reduction of augment. Some practical experiments carried out on an engine under working conditions would be very desirable. Certain it is, however, that the flexibility of track greatly reduces, and at times entirely absorbs, the dynamic augment of vertical non-balance. It is not unreasonable to say 50 per cent. of the total increase in wheel load is so disposed of.

TYPES OF RAIL FASTENINGS.

In subdividing the rail joints into types, it is often very difficult to place a given device, because of the great number of combinations possible among the seven fundamental principles employed in the solution of the problem. In the appended table wherever a clash has occurred, however, the device has been classified under the head of that idea that seemed paramount in its construction.

The seven types of joints are as follows:

1. Splicing the rail ends.
2. Supporting the rail bases by clamps or trusses.
3. Bridging the space by a wheel carrying splice or auxiliary rail.
4. Electrical or cast-iron welding.
5. Compound rails of 2, 3 or 4 pieces.
6. Lapping the rail ends.
7. Mortising the rail ends.

(1) Of these seven types, the most important by far is the first. An examination of the table giving the distribution of patents among the types, shows that nearly 55 per cent. of the patents issued have been on some form of splice, angle bars, plates, etc. The most typical and, in fact, universal of all splices, is the angle bar joint, in general use in the United States. Prior to 1870 the lower leg of the angle had not been added and the splice then in common use was the plain plate. After 1870 there were comparatively few plates patented but many styles of angles were brought out, some in combination with other types as base plates, clamps, lapped ends, etc., but always with the angle as the fundamental feature of the joint. Inasmuch as the history of the angle is so much the history of railroad track, the further discussion of this type has been taken up in a chapter by itself.

(2) The second type is one that has but few followers as compared with the angle bar, having been used in but 8 per cent. of the patents issued. The two most prominent examples of the truss type are the "Fisher" rail joint, see Fig. 20. and the "Long Truss" rail joint, Fig. 21, both of which will be discussed in a later paper. The table shows that the type was practically unknown or unthought of in the early days of railroads and has become prominent only in recent times. This but proves that the present heavy wheel loads are forcing railroad men to try every device known in the endeavor to improve on the common angle bar.

(3) The oldest device of the third type belongs to Germany and was patented in 1851. The first U. S. patent was granted in 1855. Both of these were wheel-bearing splice bars. The first "auxiliary rail" fastening was invented by J. Adams in 1872. In 1880 the New York, Pennsylvania & Ohio Ry. tried the type (Fig. 22) experimentally, and found it very hard on rolling stock. After several years it was entirely given up. In this joint, the inside splice was long enough to cover the two inside bolts only, the auxiliary rail extending 9 in. beyond on each end. At the present time there is but one joint in service in the United States of the type under discussion. This is the "Barschall" rail joint, Fig. 23. As may be seen in the figures, the N. Y., P. & O. joint and the Barschall have many points in common, yet the latter has a decided advantage in the filler block.

(4) Electrical and cast-iron welding of rail ends is a process that has only recently come into use. Prior to 1892 it was an unknown thing except that it had been tried ten years previously by one Smith who, after experimenting for a short time, gave it up. The first electrical work was done for the West End Street Railway of Boston. It was not successful. Shortly afterward the process was taken up in St. Louis and there so manipulated that the joints held. In 1893 the first cast-iron welding was done. It is the latter process that has had the greater success. The Falk joint (Fig. 24) is the most widely known and popular of the joints of this type now on the market. As far as results show anything the joint is giving good satisfaction. Any welding process is available only for street car work where rails and ties are

buried. A good example of the cast welded joint in track is the Third Avenue Line in New York City.

(5) During the earlier history of railroads, the compound rail, composed of two, three or four parts, had a prominent place. Many noted engineers gave their attention seriously to that type of track construction, and several promising patents were taken out. The fact that 22 per cent. of all the patents issued have been on some form of compound rail is good evidence that with some persons it is still considered a feasible scheme. Its great drawbacks are its multiplicity of parts and the consequent difficulty in making them fit snugly enough to avoid excessive wear. Another criticism is that it is well nigh impossible to hold the pieces together tight enough to prevent rattling and loosening of bolts or rivets. The last compound rail used in the United States was on the Southern Pacific. Its life was short and it has long since found its way to that graveyard of hopes, the railroad scrap heap. Fig. 25 shows a cross-section that was adopted in several patents, with slight variations, and is as good as any for illustrating the principle of the device. The joints were arranged to overlap half the length of each piece.

(6) Lapping rail ends is accomplished in several ways, most commonly by upsetting the rail ends as in the Lightfoot patent, used experimentally on the Pennsylvania Railroad several years ago. See Fig. 26. In this joint angles were entirely dispensed with. The rail was taken out of the tracks and scrapped, having proved itself unable to do the work.

A second system of lapping ends is that employed in the Haarmann Victor joint, Fig. 27. As may be seen, the web is not in the center of the cross-section, but is misplaced half its thickness from the vertical axis of symmetry. By this scheme, the rail has a double web the whole length of the lap, besides being strengthened by heavy angles projecting below the top of ties. This joint has never been used in the United States, but has had extended service in Europe with results that speak very well for the device. American engineers do not take kindly to any device requiring a special rail end, consequently have never given joints of this type any very comprehensive trial.

(7) Mortising rail ends, see Fig. 28, has never been popular with railroad men. There has never been a joint devised, along this line, that has been thought worthy of a trial, and it is doubtful if one ever will be. To a great extent the reasons why a welded joint is not applicable for steam road practice, hold good in mortised rail ends. It is not possible to make a fit that will insure anything like a transmission of the wave motion and yet allow for expansion. Furthermore the ends are of necessity so constructed that each rail keys into the one back of it. In case of broken rail, etc., it is very inconvenient. As a device for connecting rails, mortising has no place in modern railroad practice. It is one of the relics of a time past when such things were possible.

(*To be continued.*)

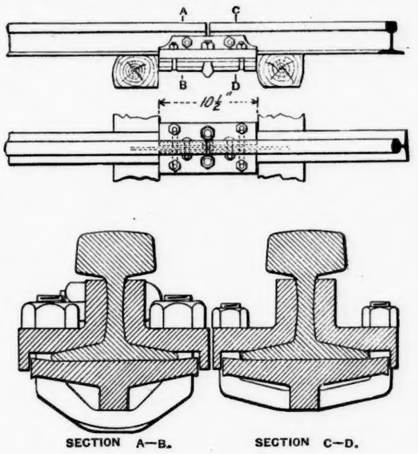


Fig. 20.

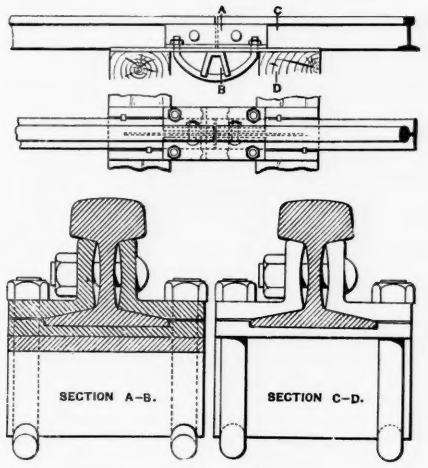


Fig. 21.

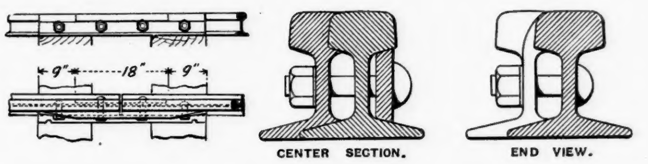


Fig. 22.

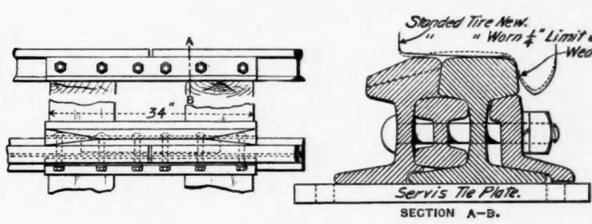


Fig. 23.

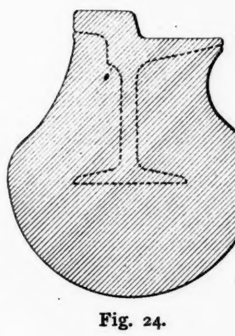


Fig. 24.

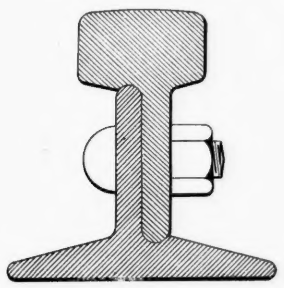


Fig. 25.

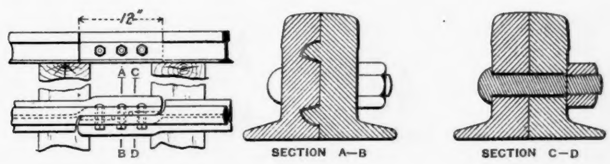


Fig. 26.

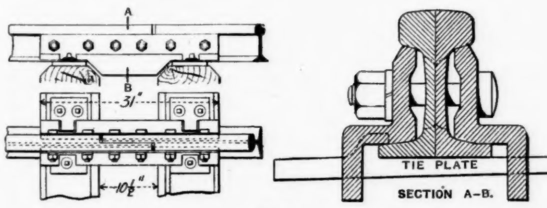


Fig. 27.

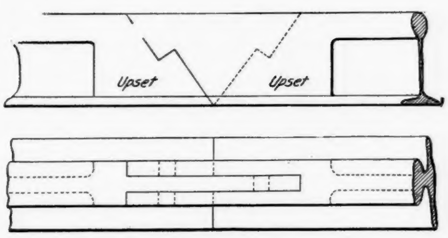


Fig. 28.

Certain Types of Rail Joints.

The Technical Education of Business Men.

BY W. A. SCOTT, PH. D.*

The present academic year seems destined to mark the beginning of a new development along educational lines in the United States. No less than five of our leading colleges and universities have opened new commercial courses or schools of commerce. In the case of at least two of these institutions the courses announced are of the same character as those which have been pursued in our larger institutions for many years, and, therefore, represent nothing new for the country as a whole, though they mark an important step in advance for the institutions in question. The universities of the City of New York, Pennsylvania and Wisconsin, however, have inaugurated a genuinely new departure in the form of technical courses for the training of young men who wish to engage in commercial pursuits. Their purpose is to furnish to such young men the same sort of training that is now supplied to prospective engineers and farmers in schools of engineering and agriculture. This particular branch of technical education is new in this country. The University of California made a beginning along this line two years ago and, therefore, deserves the honor of having been the first to enter this new field; but this seems now destined for the first time to take its place by the side of other branches of technical education in the leading colleges and universities of the country.

The term technical education as applied to commercial pursuits needs explanation. It must be distinguished, on the one hand, from the study of history, political science and economics, as it is ordinarily pursued in our institutions of higher learning, and, on the other hand, from the study of those features of the technique of commerce which can only be learned in the actual conduct of business.

The study of history, political science and economics, as now pursued, deals with the characteristic features or the more general aspects of society. Its aim is to discover the laws of social development. It deals with facts for the purpose of revealing the general principles which lie back of them, and the subject matter of the study, as it is presented to students, consists chiefly of the general principles which have already been discovered, and concrete facts are presented usually by way of illustration only. There are, of course, exceptions, to this general statement. Advanced students are put to the study of details and concrete facts, but the purpose of their work and the aim of the instruction which is given to them is to establish scientific principles, and not to solve practical problems. The importance of studies of this sort cannot be overestimated, and it is certain that they must constitute the basis for the technical education of which we are speaking; but the fact is patent that a student may pursue these lines of study to a very great length without acquiring that familiarity with the business world and with the problems of actual

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DISTRIBUTION OF PATENTS AMONG THE DIFFERENT TYPES.

Number Issued in Each Year from 1853 to 1898 Inclusive.

Type of Fastening	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.
Splicing rail ends, plates or angles, or both with base plate	..	1	..	..	..	..	1	2	1	3	1	1	2	1	2	5	8	8	5	5	16	12	22
Supporting base of rail by clamps or trusses	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	1	3	..	3	..	2	..	3
Bridging the joint by wheel-carrying splice or rail	..	..	1	..	..	..	..	..	..	..	..	..	1	..	1	1	1	..	..	..	1	..	..
Electrical or cast welding forming continuous rail	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Compound rails, 2, 3 or 4 pieces, bolted or riveted	2	..	..	1	4	..	2	..	2	..	1	4	2	7	9	10	6	2	..	3	13	4	1
Lapping rail ends	..	..	..	..	..	..	..	..	1	..	..	..	1	1	1	..	1	..	..	1	3	.	2
Mortising rail ends	..	1	..	..	..	..	1	..	..	..	..	..	..	2	..	1	..	..	..	..	2	3	1
Totals	2	2	1	1	5	..	4	2	4	3	2	5	6	11	14	18	19	10	8	9	37	19	29

Type of Fastening	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	Tot's.
Splicing rail ends, plates or angles, or both with base plate	13	9	8	5	9	7	10	15	9	13	28	19	13	28	33	22	33	27	21	14	7	5	23	467
Supporting base of rail by clamps or trusses	3	1	2	2	..	2	..	1	2	4	2	3	2	3	6	4	6	7	3	..	1	1	2	71
Bridging the joint by wheel-carrying splice or rail	2	..	3	..	.	1	..	1	..	2	..	1	..	1	1	2	..	..	..	..	..	..	6	26
Electrical or cast welding forming continuous rail	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	1	..	..	..	..	..	4
Compound rails, 2, 3 or 4 pieces, bolted or riveted	4	4	6	5	5	6	3	5	7	5	2	5	6	10	10	5	6	9	7	1	1	..	1	186
Lapping rail ends	1	2	1	1	1	2	4	1	..	5	3	3	3	3	4	1	10	4	4	5	2	1	..	72
Mortising rail ends	..	2	1	..	3	..	..	1	2	..	1	2	..	1	3	2	1	..	1	..	..	2	2	35
Totals	23	18	21	13	18	18	17	24	20	29	36	33	24	46	57	37	58	48	36	20	11	9	34	860

business life which is essential to a person who expects to succeed in large commercial enterprises. The technical education of the prospective business man must aim primarily at giving him this familiarity. Its purpose must be to enable him to solve successfully the problems which he must meet in the actual conduct of affairs. It must aim to give him such information as is of importance in his business, and it must teach him to apply the principles of natural and social science to the actual conduct of commercial enterprises.

There is a certain form of technical education which no school or course of study can supply. Every business establishment has its own peculiar methods which can only be acquired in the institution itself. The management of a great business concern also involves the control of men, the organization of details, and the solution of problems which arise from day to day and cannot be anticipated. Technical courses of study may assist a young man in developing his power along these lines; may reveal to him in a general way the nature of the questions which will confront him; but the actual skill which is essential to success can only be acquired in the actual doing of the things themselves. One cannot be certain that he possesses the ability to lead, organize and control men until he has actually attempted to do these things. No amount of instruction about the problems which such leadership involves will actually give him the power although it may assist him in the work.

Between this sort of technical education, and the study of history, economics and political science, as it is at present pursued, there is a wide gap which it is the purpose of the new schools of commerce to fill. It is manifest that they cannot guarantee to turn out successful business men any more than the engineering school can guarantee to turn out successful engineers. They cannot furnish all the knowledge that is necessary for the conduct of business any more than the engineering school can furnish all the knowledge that the engineer needs. Nothing can take the place of the actual conduct of business in the acquisition of certain forms of knowledge, and nothing can take the place of history, political science, and economics as a means of educating the student, and of laying the necessary foundations for the technical studies which it is the especial purpose of schools of commerce to supply.

The problem before these schools is a difficult one and it will not be perfectly solved until considerable experience along this line of education has been acquired. Mistakes will unquestionably be made at the beginning, but it is a matter of no small significance that such institutions as the Universities of the City of New York, Pennsylvania, Wisconsin and California have definitely attacked the problem, and have placed themselves in the way of acquiring the experience necessary to correct the mistakes incident to pioneer work. The programmes which are being followed during the present year are necessarily tentative, and they represent the solutions which the institutions in question have proposed for the problem before them.

In working out its programme the faculty of the University of Wisconsin asked itself the question,—what sorts of knowledge does the young man need who in the immediate future is to carry to a successful issue the great commercial enterprises of the United States. Its answer to this question is in substance as follows:

I. He should be familiar with the nature and workings of the industrial organism of which he is to be a part and through the manipulation of which he must accomplish his ends. In order to give him this familiarity the following five lines of study are offered:

(1). Courses in commercial geography which deal with the sources and distribution of the raw materials of manufactures and commerce, the present location of the most important branches of manufacturing industry, and of the chief routes of commerce, and the circumstances which determine, and from time to time, modify their localization.

(2). Courses in transportation, in which the student studies the transportation systems of the most important countries of the world including their railroads, canals and ocean steamship lines, the various methods of classification of goods for transportation purposes employed in different countries, methods of rate-making, the various systems of government ownership and control, consolidation and pooling, traffic organizations, and in particular the characteristic features of the transportation system of the United States.

(3). Courses in money and banking, which are designed to acquaint the student with the nature and functions of money and banks, the monetary systems of the great commercial nations, the laws and methods of foreign exchange, the various kinds of securities which are used in international and domestic commerce, stock markets, bi-metallism and monometallism, and the history of the currency systems of the chief commercial nations.

(4). A course in business organization and management, which might perhaps better be described as a course in private administration to distinguish it from the courses in public administration which are given in the departments of political science of our universities. This course includes a study of the various forms of business organization, such as corporations, partnerships, private business concerns and trusts, the organization of commerce in its various branches including the various classes of middle men and the markets for various sorts of products, and the methods of organization and management of typical concerns in the various lines of industry.

(5). Courses in economics and economic history. It is impossible to understand existing business institutions without the study of the circumstances which brought them into existence, and which from time to time modify their character and forms. Hence the necessity of courses of this sort. The study of economic history familiarizes the student with the actual growth and development of industry, while the study of economics reveals to him the principles involved and the real nature of the forces with which he has to deal. In these courses emphasis is laid upon the history of commerce and upon the theories which have influenced and still affect the commercial policy of nations.

II. Besides a knowledge of the nature and workings of the industrial organism the prospective merchant should be familiar with the various processes through which the chief articles of commerce have to pass before they reach their finished state. This sort of knowledge the school proposes to furnish in the form of courses in what it calls the materials of commerce, which courses will be carried on in connection with a commercial museum. The university already possesses as a nucleus for such a museum about 5,000 economic plants, together with the various commodities manufactured from them, an excellent collection made by our School of Pharmacy. It expects to enlarge this collection in the immediate future and hopes to be able soon to equip its museum with samples of the most important articles that enter into the commerce of the world. The courses in the materials of commerce will consist of a study of the history of the various commodities from the raw material to the completed article, and will include a study of the various processes and forms of adulteration, of the qualities of goods, the costs of their manufacture, etc., etc.

III. A knowledge of certain branches of law is now a desideratum for the business man. Accordingly among the technical courses of the school are included a course in the commercial law of the United States, courses in tariff legislation, laws pertaining to labor, capital, corporations, etc., and courses in the commercial law of various foreign countries with which the United States engages in commerce. All of these are special courses designed to meet the needs of business men and in consequence will not be so detailed and technical as the courses on the same subjects given in the law school for prospective lawyers.

IV. The man who expects to represent an American business house in a foreign country should be familiar with the language which his customers speak. In many parts of the world American firms are now at a great disadvantage. Their agents lack a knowledge of the language and are obliged to deal with their customers through interpreters or by means of printed circulars and announcements translated from English. This disadvantage has been felt to such an extent that foreign agents are employed in large numbers to transact business for American houses. It seems to us at the University of Wisconsin that young men who expect to engage in the commerce of the United States in the immediate future should be equipped with at least one foreign language, and we have accordingly made the acquisition of a reading, writing and speaking knowledge of French, German or Spanish a requirement in our School of Commerce. In addition we offer instruction during the coming year in Italian and Russian and have so arranged our courses that it is possible for a student to acquire a second language if he so desires. In the instruction given in all these languages especial attention is devoted to commercial correspondence and business and legal forms.

V. The sciences of Physics and Chemistry are used in industry in such a variety of forms that at least an elementary knowledge of them is necessary for the well equipped business man. Our course, therefore, includes a year of work in each one of these sciences. The course in physics is followed by a course in the generation and transmission of power which will give the student such a practical knowledge of the application of steam, electricity and water power to the conduct of business as will enable him to avoid the mistakes in the expenditure of energy and the investment of capital which have so frequently wrecked otherwise promising business enterprises. The course in chemistry is necessary to the study of certain of the materials of commerce mentioned above, as well as useful in a thousand ways which cannot be anticiptted.

VI. The above branches of study are required of all students who are candidates for the degree no matter what particular line of business they expect to enter. In addition the plan of the school includes certain groups of courses designed to furnish preparation for particular lines of business. For the coming year we offer a group of courses preparatory to the consular service. This group will be organized and conducted by Hon. J. C. Monaghan, who, while serving the United States as Consul to Germany during the last twelve years, made a special study of commercial education in Europe, and is well equipped in every way to furnish students the technical instruction which is needed for the consular service. Our plan also includes the organization of a group of courses preparatory to the banking business, and other groups designed to give students the technical knowledge necessary to engage in commerce in the Orient, in South America and the West Indies, and on the continent of Europe.

Such in brief is our plan. We expect to learn much from the experience of the present year and we shall doubtless largely supplement and perhaps modify these courses in the future. For the present they seem to us the best that can be devised for the purposes in view. We believe that a course of study such as has been outlined will possess very great educational value. It will be accompanied by thorough courses in history, economics, political science, mathematics and English, and opportunity will be given to a limited extent to make elections from the large number of courses given in other departments of the university.

At Wisconsin we propose to place this new course in commerce on the same level with the other courses in the Colleges of Letters and Science and Engineering, and to grant to the student who successfully completes it a baccalaureate degree. We believe that the educational value of the course will be in no respect inferior to that of any other course given in the university, and in the correlation of the courses and the methods of instruction we expect to keep in mind the fact that the young man who expects to do business on a large scale needs to be educated in the best sense of the term, as well as equipped with the technical knowledge which the prosecution of his business requires.

New Shops of the Hannibal & St. Joseph Railroad.

As said in our issue of Aug. 17 last, the present shops of the Hannibal & St. Joseph, at Hannibal, Mo., are to be replaced by new buildings and equipment, and the work on the buildings has now been begun. They will be of brick with stone foundations and with steel roof trusses. The general plan of the new shops is shown in Fig. 1, and it will be seen that all the buildings are

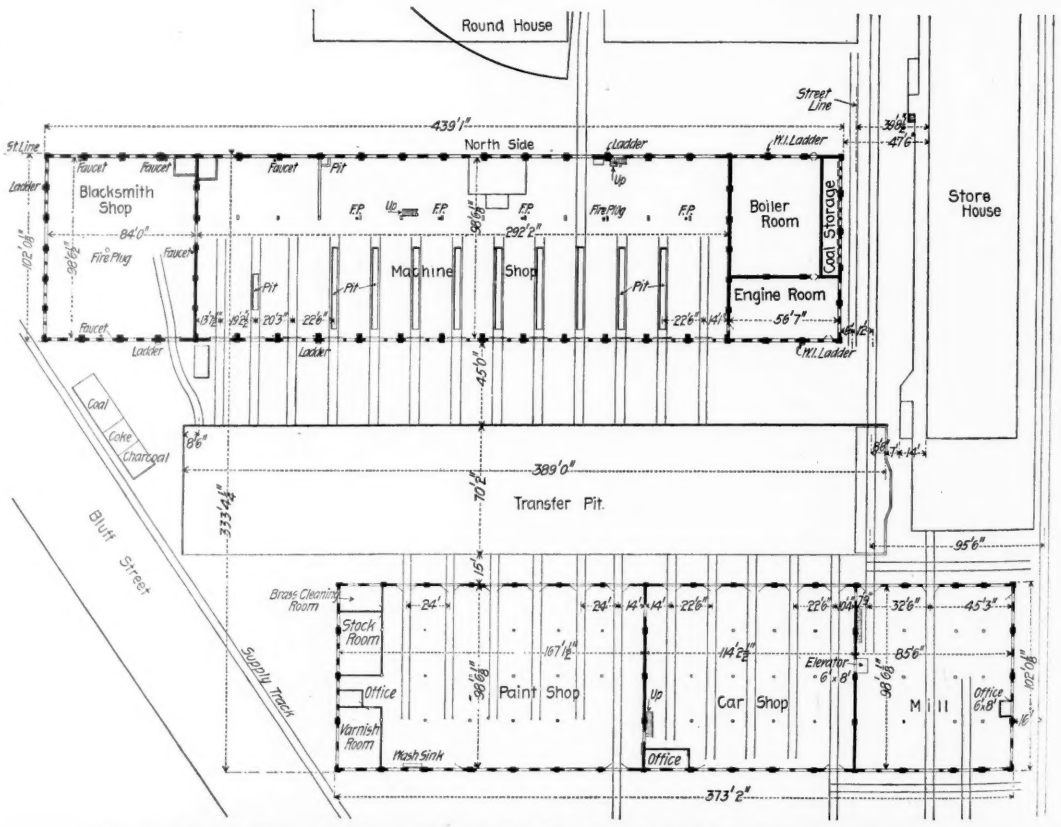


Fig. 1.—General Plan of the New Shops at Hannibal, Mo.—Hannibal & St. Joseph Railroad.

served directly by the transfer table. On one side are the blacksmith, boiler, machine and erecting shops and power plant while the paint shop and car and wood shops are opposite; a platform from the store house extends along the end of the transfer table. The tracks are conveniently arranged for bringing in materials to the store house and to the boiler room and a track for push cars leads from the machine shop to the roundhouse.

There are nine pits in the erecting shop. The machines are grouped on the north side of this building and

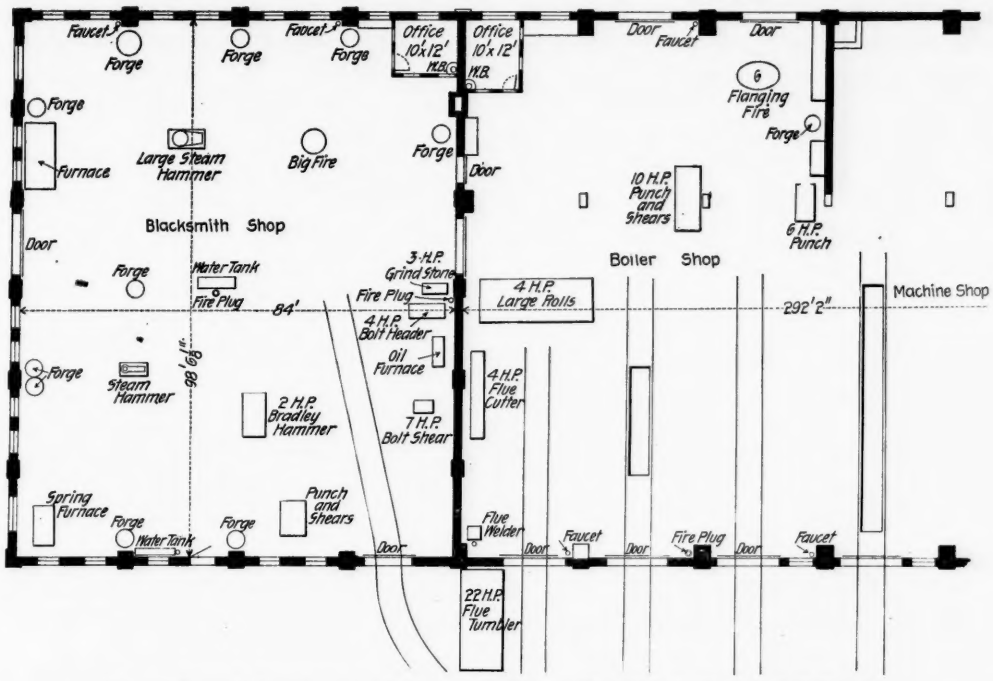


Fig. 3.—General Arrangement of Blacksmith Shops—Hannibal & St. Joseph Railroad.

the space allotted to machines is set off by a row of nine columns, between which and the pits is a clear passageway. These columns support a second floor or platform over the machines and also carry the track for one end of an overhead traveling crane which serves the pits and boiler shop. This crane will be used to handle locomotive boilers, frames and cylinders in addition to all kinds of lighter materials. The second floor or platform, which also extends out over the boiler shop, is intended for copper and tin shops and a place for various kinds of light work, as well as for toilet rooms and clothes closets for the men. The hot air heating apparatus will also be placed on this platform. The tool room and foreman's office are near the center of the machine shop, and from Fig. 2 the arrangement of the machines will be seen. The following is a list of the tools referred to by numbers on the engraving of the machine shop, together with the esti-

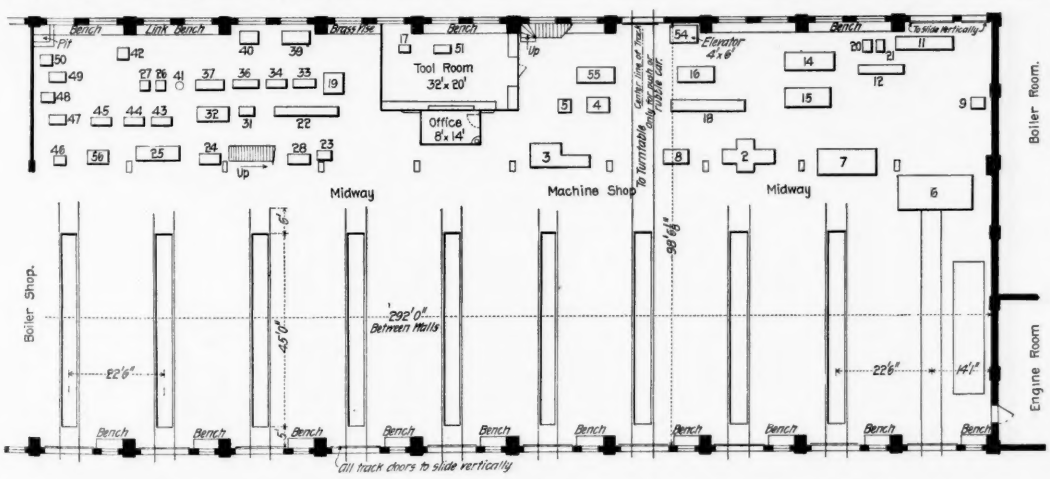


Fig. 2.—Arrangement of Tools in Machine Shop—Hannibal & St. Joseph Railroad.

mated horse-power required to drive them. The tools are given by name on the plan of the boiler and blacksmith shops.

Key to Tools in the Machine Shop.

No.	Name.	H.-P.	No.	Name.	H.-P.
1.	54 by 54-in. planer..	10.0	28.	Screw turret lathe..	1.0
2.	42 by 42-in. planer..	4.0	31.	Drill	1.5
3.	30 by 30-in. planer..	3.0	32.	Drill	2.5
4.	Shaper	3.0	33.	24-in. lathe.....	4.0
5.	Shaper	1.0	34.	24-in. lathe.....	4.0
6.	Wheel lathe.....	5.0.	36.	17-in. lathe (links)..	1.0
7.	48-in. lathe.....	4.0	37.	17-in. lathe.....	1.0
8.	15-in. slotter.....	5.0	39.	20-in. brass lathe...	1.5
9.	Car wheel borer....	4.0	40.	18-in. brass lathe...	2.0
11.	Car wheel press....	3.0	41.	Drill	1.0
12.	Journal lathe.....	3.5	42.	Link grinder.....	1.0
14.	30-in. lathe.....	2.0	43.	14-in. lathe.....	0.75
15.	Guide grinder.....	10.0	44.	14-in. lathe.....	0.75
16.	30-in. packing lathe	2.0	45.	14-in. lathe.....	0.75
17.	Drill grinder.....	4.0	46.	Car brass borer....	2.0
18.	20-in. shaft lathe...	2.0	47.	4-sp'ndl'd nut tapper	4.0
19.	Milling machine....	3.0	48.	Double bolt cutter..	3.0
20.	Grinding machine..	3.0	49.	Double bolt cuttr..	3.0
21.	Grindstone	1.0	50.	Single bolt cutter...	2.0
22.	40-in. lathe.....	4.0	51.	Tool room lathe....	2.0
23.	Centering lathe.....	0.75	54.	Elevator	5.0
24.	Drill	3.0	55.	30-in. lathe.....	2.0
25.	Radial drill.....	3.0	56.	Drill	3.0
26.	Emery wheel.....	0.75		Traveling crane....	10.0
27.	Grindstone	1.0			

It is the intention to use electric motors of various sizes to drive all the machinery in the shops excepting the air compressor in the engine room and two steam hammers in the blacksmith shop. Most all machines that require 5 h.p. and over to run them will be fitted with a separate motor, while smaller machines that are used most of the time will be grouped and one motor will be used to drive two or more. The transfer table and traveling crane will be driven by electric motors and the shops and the surrounding buildings will be lighted by electricity. The boilers will be fitted with automatic stokers and induced draft apparatus and will furnish steam for engines direct-connected to generators. The car and paint shops will have but one floor, but the car shop mill will have a second floor used for upholstery and other light work. The forges of the blacksmith and boiler shops will be equipped with down draft apparatus which will carry off all the smoke and gases.

We are indebted to Mr. F. A. Chase, General Master Mechanic, for drawings and information.

The Transportation and Preservation of Perishable Freight.*

BY HENRY MILLER, *Asst. Supt. Burlington Route.*

The preservation of perishable freight in transit devolves very largely on the railroads, and heavy loss and damage claims are not infrequent. Having had occasion to investigate this subject rather extensively, I was very much surprised to find that but few transportation lines had a systematic method in effect.

The temperatures at which perishable goods are liable to damage vary greatly with different commodities, their condition when shipped, how long they may be in transit, whether they are kept continually in motion, etc. Shippers and agents concur in the statement that danger in transportation by freezing can be practically eliminated by the shipment of produce by modern methods—the lined car suffices in spring and autumn, and usually during the winter, while in extreme weather the heater car is used. The temperature of the produce when put into the car is quite a factor to be observed. If it has been exposed to a low temperature for a considerable time before, it is in a poor condition to withstand cold, and the length of time so exposed should be taken into account. It is also claimed that a carload of produce, like potatoes, will stand a lower temperature when the car is in motion than when at rest.

In ordinary freight cars perishable goods can be shipped with safety with the outside temperature at 20° and in refrigerator cars at 10°. In the latter these goods may be safely shipped with a temperature outside of from zero to 10° below, if the car is first heated, and at the end of the journey the goods are immediately taken into a warm place without being carted any great distance. The better class of refrigerator cars will carry all perishable goods safely through temperature as low as 20° below zero, provided they are not subjected to such temperatures longer than three or four days at a time, while with the ordinary refrigerator cars temperatures of zero are considered dangerous, especially if the goods they contain be of the most perishable kind.

Fresh beef for shipping should be chilled to a temperature of 36°, although under favorable conditions it will arrive in a good state if chilled to only 40°. The cars should be at the same temperature as the chill rooms, and it is considered very important to have an even temperature from the time the beef is taken from the chill room until its arrival at its destination.

In shipping long distances in summer it is necessary to re-ice the cars, the frequency depending on the prevailing temperature, so that no fixed rule can be given. Re-icing cars in transit, especially those loaded with fresh meats from the large packing centers, has caused the railroads to provide facilities designed to minimize the detention of the fast trains in which this business is usually carried.

I presume some of you have had more or less experience with shipments of perishable freight which have been improperly cared for through vague and indefinite instructions, or the absence of any instructions about icing or otherwise caring for the freight. It is a matter of record that a car of ripe fruit accompanied by a waybill bearing a notation, "Re-ice at all icing stations," was hauled 1,000 miles without attention, and arrived at destination in bad condition. Investigation developed the fact that while ice was stored at a number of stations en route they were not designated icing stations, and the authorities invariably offered the excuse that they did not construe the directions as applying to their plant, hence took no action. The result of such notations is obvious, and on the theory that "What is everybody's business is nobody's," it is important that icing stations be specified. No doubt had certain stations been named the car in question would have received proper attention. It also occurs that cars are iced in transit and the shippers decline to pay for the ice because it was not authorized. I remember a case where a shipment of bacon, cured and smoked, was loaded in a refrigerator car and given a thorough icing because the employees at a distant point were in doubt. At another time a car of bananas was iced, which, of course, injured the fruit; therefore, it seems necessary to have instructions which are explicit.

The Burlington road recently adopted instructions which, for the purpose of this paper, are reproduced here. As they are somewhat lengthy I will not read them, but give a brief summary of the icing instructions, which are designed to show when refrigerator cars are loaded with freight that does not require icing the waybill shall bear a notation to that effect; also that specific information shall be given about re-icing. This is quite important, because who can tell better what is required in that respect than an agent assisted by a shipper of experience, who have before them a list of the icing stations on the line, and a schedule of the train in which the car will be forwarded, showing the exact time it passes each icing station. Provision is made for conductors to wire advance notice of cars approaching icing stations, so that preparation may be made for prompt service, and chief dispatchers are required to look after any cars that may be disabled or otherwise delayed in transit. These instructions seem to cover every contingency, and are working very well in practice.

*From the September Proceedings, St. Louis Railway Club.

Trainmen's Uniforms on the Alton.

We noted, a few weeks ago, the fact that the Chicago & Alton would furnish uniforms free to certain employees. As there was a slight inaccuracy in the statement, as published, we have procured a copy of the circular on the subject which was issued by General Superintendent Gray, and give the substance of it below.

Standard uniforms have been prescribed and must be worn by all passenger train employees at all times while on duty. One complete uniform will be furnished annually by the Company free of expense to each employee in continuous service with the company for five years, in his present position. Two uniforms annually, that is, a summer and a winter uniform, will be furnished free of expense to each employee in continuous service ten or more years, in his present position. Uniforms furnished at the expense of the company must only be worn while employee is on duty. All uniforms, whether provided by the company or procured at the expense of the employee, must be made in strict accordance with specifications furnished, and by designated makers.

Dining car waiters will be furnished with white linen coats, aprons, etc., company's property, without charge, regardless of term of service.

Each train conductor and dining car steward must provide himself, at his own expense, for summer wear during the months of June, July, August and September, with single-breasted white vest of design and material prescribed by the company; uniform buttons for such vest and linen cap covers for summer wear will be furnished by the company without expense.

Each train baggageman, in addition to the regular uniform, must provide himself, at his own expense, or will be furnished free of charge, according to term of service, with working blouse and overalls of light color khaki.

Uniform of engineers and firemen will consist of cap, working blouse and overalls of dark khaki. All train employees are required to wear white linen shirts, collars and cuffs while on duty. Train conductors and dining car stewards must wear stand-up collars, black bow ties.

Brakemen, porters and baggagemen, white collars, black bow ties. Dining car waiters standing wing collars, white ties. All passenger train employees must wear black shoes while on duty.

Uniform style overcoat will be prescribed by the company which may be worn while on or off duty, and procured at employee's expense, either through the company's manufacturers, or elsewhere, so long as the prescribed style, color and material be adhered to.

The Union News Company are required under their contract to keep their train agents on this line uniformed in dark blue uniforms; Navy jacket and cap; material same color and weight as Chicago & Alton train employees; maroon trimmings on coat sleeve and face of coat, with maroon stripe down the side of pantaloons. Chicago & Alton train conductors must see that Union News Company's representatives are properly uniformed.

Daily inspection will be made at Chicago, St. Louis, Kansas City and Peoria of the uniforms and general appearance of all train employees. No excuse will be accepted for any employee appearing in an untidy condition. Uniformity, cleanliness and a general pleasing appearance is a necessity to the service, and will be insisted upon.

As a public recognition of faithful and efficient service, each passenger train employee who has been in continuous service five years in his present position shall, while on duty, wear on the left sleeve of coat one star, and one additional star for each additional three years' service, which will be furnished by the company free of charge.

Train Accidents in the United States in August.

COLLISIONS.

Rear.

3rd, on Pittsburgh, Ft. Wayne & Chicago, at Hanna, Ind., a passenger train ran into the rear of a preceding freight. The rear brakeman of the freight was killed.

6th, 1 a. m., on St. Louis Southwestern, at Aurich, Ark., a passenger train ran over a misplaced switch and into the rear of a freight standing on the sidetrack, wrecking the engine, two baggage cars, caboose and two freight cars. The conductor, one brakeman and two other men in the caboose were killed and the engineman and fireman were injured.

6th, on Southern Pacific, near Hugo, Or., a passenger train ascending a steep grade was run into at the rear by an empty engine.

13th, on Southern Railway, near Tennille, Ga., a mixed train consisting of five freight and two passenger cars broke in two behind the fourth car, and the rear portion afterward ran into the forward one, damaging three cars. Five trainmen and 11 passengers were injured. The brakes on the three rear cars were not under control of the engineman. It is supposed that the parting of the train was due to one drawbar dropping below the other, one of the cars being very heavily loaded.

14th, on Nashville, Chattanooga & St. Louis, near Kingston Springs, Tenn., a freight train ran into the rear of a preceding work train, and the engine and six cars were ditched; one trainman injured. It is said that the work train had sent out a flag, but that it was not properly observed.

15th, 1 a. m., on Atlantic City road, at Risley, N. J., a freight train was run into at the rear by a train of empty passenger cars, and several cars were badly damaged. The fireman was injured. There was a dense fog at the time.

16th, 1 a. m., on Delaware, Lackawanna & Western, near Dover, N. J., a freight train became uncontrollable on a descending grade and ran into the rear of a preceding freight, wrecking 24 loaded cars and a caboose. The engine was overturned. Two trainmen were injured.

17th, 2 a. m., on Chicago, Rock Island & Pacific, near Bethune, Colo., passenger train No. 6 ran into the rear of a preceding freight train, and the engine was overturned. The engineman and fireman were injured. It is said that a flagman was sent out from the freight, but it does not appear whether he went as promptly as he should have done.

20th, on Pennsylvania road, at Witmer, Pa., a freight train ran into the rear of a preceding freight, wrecking the caboose. A brakeman was killed. It is said that the engineman had fallen asleep.

21st, 8 p. m., on New York Central & Hudson River, at Kensico, N. Y., a freight train standing at the station was run into at the rear by a following freight, making a bad wreck. Three trainmen were killed. The standing train was not properly protected by flag, and the approaching train came on at high speed.

23rd, 5 a. m., on Pennsylvania road, near Ernest, Pa., a train of empty passenger cars ran into the rear of a switching freight train, badly damaging the engine and one car; one brakeman was badly injured. There was a dense fog at the time.

24th, on Texas & Pacific, at Pilot Point, Tex., a passenger train ran into the rear of a preceding freight train, damaging the engine and the caboose. Seven passengers and three trainmen were injured.

And 18 others on 14 roads, involving 2 passenger and 26 freight and other trains.

Butting.

2nd, 1 a. m., on Louisville & Nashville, at Grand Bay, Ala., butting collision of freight trains, badly damaging both engines and many cars. The fireman was injured.

2nd, on Pennsylvania road, near Douglasville, Pa., butting collision of freight trains, badly damaging both engines and several cars. The enginemen and firemen jumped off and escaped with slight injury.

3rd, on Philadelphia & Reading, at Mahanoy City, Pa., butting collision of freight trains, wrecking both engines and many cars. A passenger train on the adjoining track ran into the wreck.

7th, near Hilliard, Wash., butting collision between a passenger train of the Spokane Falls & Northern and a freight train of the Great Northern. One trainman was killed and three trainmen and several passengers were injured.

13th, on Southern Railway, near Morganton, N. C., butting collision of freight trains; one brakeman killed and five trainmen and two passengers injured. The collision is said to have been due to a misunderstanding of orders.

13th, 11 p. m., on Baltimore & Ohio, near Baltimore, Md., butting collision of freight trains; engineman and fireman killed.

14th, on Denver & Rio Grande, near Colorado Springs, Colo., butting collision of passenger trains. Two passengers were killed and four injured.

15th, 5 a. m., on Grand Rapids & Indiana, at Pierson, Mich., butting collision of passenger trains, wrecking both engines and both baggage cars and damaging several passenger cars. Six trainmen and two passengers were killed and two passengers and six trainmen were injured. There was a dense fog at the time. It is said that a telegraph operator accepted an order for the northbound train after it had passed his station, and thus caused the wreck.

22nd, on Norfolk & Western, at Maxwell, Va., butting collision between an empty engine and a freight, making a bad wreck. Two trainmen were killed and six were injured. It is said that the freight was moving at 30 miles an hour and the empty engine at 40.

25th, on the Erie road, near West Seneca, N. Y., a freight train ran over a misplaced switch and into the head of a freight train standing on the side track, doing considerable damage. The passenger engineman was injured.

And 12 others on 12 roads, involving 2 passenger and 22 freight and other trains.

Crossing and Miscellaneous.

3rd, 3 a. m., at North Tonawanda, N. Y., collision between a freight train of the New York Central and a train of empty passenger cars on the Lehigh Valley; one fireman injured.

7th, on Chicago, Indianapolis & Louisville, at South Raub, Ind., passenger train No. 3 collided with a freight engine standing on a side track. The passenger fireman was killed and two other trainmen were injured.

9th, on Central of New Jersey, near Dover, N. J., collision between a passenger train and a freight, badly damaging both engines and several cars; two trainmen injured.

14th, on Midland Terminal, near Goldfield, Cal., a passenger train ran over a switch which had been misplaced by mischievous boys, and collided with two freight cars standing on a side track. A trainman and a man stealing a ride were injured.

14th, on Illinois Central, at Glen Carbon, Ill., collision between a pay car train and a freight. The Division Superintendent and a fireman were injured.

16th, on Atchison, Topeka & Santa Fe, near Winfield, Kan., a freight train ran over a misplaced switch and into a car standing on the side track, wrecking the engine and several cars. The engineman was injured.

20th, on Illinois Central, at Paducah, Ky., a gravel train backed into a freight train, and about 30 cars were damaged, seven of them being completely wrecked. A brakeman was injured.

22nd, on Boston & Maine, near Fitzwilliam, N. H., a passenger train ran into a work train and an engineman was fatally injured.

29th, 4 a. m., on Southern Railway, near Blossburg, Ala., a string of freight cars, becoming unmanageable on a steep grade, collided with a switching engine, doing considerable damage; a brakeman was badly injured.

29th, on Central New England, at Highland, N. Y., a westbound freight train broke in two and the rear portion ran back some distance and collided with a passenger train about one mile west of the Poughkeepsie Bridge. Three passengers and one trainman were injured.

31st, 11 p. m., on Chicago & Northwestern, at Tracy, Minn., a switching engine was run into by a passenger train entering the yard. The runner of the switching engine tried to get out of the way of the passenger train, and in so doing struck a row of empty freight cars, and several of these, with the engine, were wrecked. The engineman and fireman were injured. The collision was due to a misplaced switch.

And 25 others on 16 roads, involving 8 passenger and 37 freight and other trains.

DERAILMENTS.

Defects of Roadway.

1st, on Kansas City Southern, at Cove, Ark., a freight train was derailed and 19 cars fell through a bridge. A brakeman was injured. It is said that the bridge gave way under the weight of the engine, which was a heavy one.

1st, on Seaboard Air Line, near Meldrim, Ga., a trestle bridge gave way under a freight train and 25 cars fell into the Ogeechee River.

5th, on Southern Pacific, near Paisano, Tex., a freight train broke through a bridge which had been weakened by a flood and the engine and five cars were wrecked; engineman and fireman injured.

13th, on Cleveland, Cincinnati, Chicago & St. Louis, near Cairo, Ill., a train consisting of a locomotive and a caboose broke through a bridge and was wrecked. A brakeman was killed and three other trainmen were injured, two of them fatally. It is said that repair men had been at work on the bridge immediately before the accident. The bridge was an old one.

17th, 1 a. m., on Lake Shore & Michigan Southern, near Sandusky, Ohio, the westbound fast mail train was derailed by a broken rail and three mail cars fell off a bridge into Sandusky Bay. Two passengers and five trainmen were injured.

22nd, on Pittsburgh, Bessemer & Lake Erie, near Conneaut Lake, Pa., an excursion passenger train was derailed, apparently by a loose rail, and the engine was overturned. The engineman was killed and the fireman badly injured.

And 2 others on 2 roads, involving 1 passenger train and 1 freight.

Defects of Equipment.

21st, on the Pennsylvania road, near Stewart, Pa., the rear portion of a freight train, consisting of 10 cars of stone, was derailed by a drawbar which broke and fell upon the track. The wreck occurred in Ardara tunnel and the road was blocked about 12 hours. A brakeman jumped off and was injured.

23rd, on Philadelphia & Reading, near Tamaqua, Pa., a freight train was derailed by a broken wheel, and 14 cars were wrecked. The conductor was fatally injured.

26th, on Baltimore & Ohio, near Ilchester, Md., a car in a freight train was derailed by a broken axle and 12 cars were ditched. A man stealing a ride was killed.

And 16 others on 13 roads, involving 16 freight trains.

Negligence in Operating.

3rd, on Pennsylvania Lines, at Fischer's, Ind., a freight train was derailed at a misplaced switch and eight cars were wrecked. A man in charge of a horse was injured.

10th, on McCloud River road, near McCloud, Cal., a freight train became uncontrollable on a steep grade and, after running some distance, was derailed and ditched. One brakeman was killed and the engineman was fatally injured.

17th, on Nashville, Chattanooga & St. Louis, near Florence, Ala., a freight train was derailed at a point where the track was being repaired, and the engine was overturned. Six cars were wrecked and the engineman was injured.

21st, on Chicago & Alton, at Carlinville, Ill., a passenger train was derailed at a derailing switch and the engine was overturned. The baggageman was injured.

22nd, on Mill Valley & Mount Tamalpais Scenic Road, near San Rafael, Cal., a passenger train descending a steep grade was derailed and the engine was overturned. The engineman was fatally injured. It is said that the derailment was due to excessive speed.

23rd, 1 a. m., on Houston & Texas Central, near Hearne, Tex., a freight train was derailed at a misplaced switch and the engine and several cars were damaged. A brakeman was killed and six other trainmen were injured.

31st, on Wabash road, at Delray, Mich., a freight train drawn by two engines ran into the open draw at the Rouge River and the two engines were completely submerged.

And 7 others on 7 roads, involving 3 passenger and 4 freight trains.

Unforeseen Obstructions.

1st, on Alabama & Vicksburg, at Forest, Miss., a work train was derailed by running over a cow and a number of cars were wrecked, including several standing on a side track. Five employees were injured.

12th, 5 a. m., on Missouri, Kansas & Texas, at Caddo, Ind. T., a southbound train entering the yard was derailed at a switch which had been broken or misplaced by a brake shoe which had been dragged along the ground by a preceding train.

A few minutes afterward northbound passenger train No. 4 was derailed in a similar manner at the south end of the yard, and the engine was overturned.

12th, on Little Kanawha road, near Parkersburg, W. Va., a freight train was derailed at a switch which had been maliciously misplaced, and one engine and seven cars were wrecked. Four trainmen and two passengers were injured.

16th, on Lehigh Valley, at Splash Run, Pa., an officers' train running backward was derailed by a piece of timber which had fallen from a freight train, and the passenger car fell down a bank. Two officers of the road were injured.

24th, 2 a. m., on Wheeling & Lake Erie, near Coshocton, Ohio, a freight train was derailed at a washout and the engineman and fireman were killed.

And 2 others on 2 roads, involving 1 passenger train and 1 freight.

Unexplained.

1st, on New York Central & Hudson River, near Kingston, N. Y., a passenger train was derailed and two trainmen were injured.

12th, on Wheeling & Lake Erie, at Deep Run, Ohio, a freight train was derailed and the tender and 22 cars fell down a bank. A tramp was killed and one brakeman, the fireman and the engineman were injured, the latter fatally.

12th, on Southern Pacific, near Lake Charles, La., passenger train No. 9 was derailed and nine of the 10 cars were ditched. A part of the train ran onto a bridge, which was wrecked. One passenger was killed and one passenger and two trainmen were injured.

17th, on Chicago & Northwestern, near Kaukauna, Wis., the engine and baggage car of passenger train No. 275 were derailed and the engineman was killed.

23rd, on North Pacific Coast road, near San Quentin, Cal., a freight train was derailed and the engineman was injured.

25th, on Philadelphia & Reading, near Reading, Pa., a passenger train was derailed while running at high speed, and four cars were ditched. The fireman was killed and seven passengers were injured.

26th, on Oregon Short Line, near Feeley, Mont., a passenger train was derailed and one coach was overturned; eight passengers were injured.

30th, on Chesapeake & Ohio, near Westham, Va., a freight train was derailed and three trainmen were injured.

And 41 others on 32 roads, involving 3 passenger and 38 freight and other trains.

OTHER ACCIDENTS.

3rd, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Carnegie, Pa., a car in a passenger train was crushed and badly damaged by a mass of coal which fell from a chute at Boyd's mines used for coal locomotives. Four employees of the road riding in the car were injured.

6th, on New York, New Haven & Hartford, at New Britain, Conn., an electric motor passenger car took fire from the motor and in some way the motorman was disabled so that he jumped off the car. He supposed he had applied the brake before jumping off, but he had not, and the car ran some distance uncontrolled. Before the conductor succeeded in stopping the car five passengers jumped or fell off and were injured.

27th, on Central Vermont, near Bolton, Vt., the engine of a passenger train was damaged by running into a log 44 ft. long which had got stuck on a highway crossing. The engineman and fireman jumped off and were injured.

And 3 others on 3 roads, involving 2 passenger trains and 1 freight.

A summary will be found in another column.

Our Success at Paris an Eye Opener.

The final list of awards at the Paris Exposition has been published. In itself the document is an eloquent testimonial to the progress of the United States in the arts of peace and war, in invention and labor-saving devices, in the ornamental and the merely useful. The awards are divided into five classes—Grand Prizes, Gold Medals, Silver Medals, Bronze Medals and Honorable Mention. Excluding France, American exhibitors have received more awards than any other country in every class except the first. Of the Grand Prizes we have captured 215, while Germany gets 236, Russia 209 and Great Britain 183. The other awards are as follows: Gold Medals—United States, 547; Germany, 510; Russia, 346; Great Britain, 406. Silver Medals—United States, 593; Germany, 575; Russia, 411; Great Britain, 517. Bronze Medals—United States, 501; Germany, 321; Russia, 321; Great Britain, 410. Honorable Mention—United States, 348; Germany, 184; Russia, 206; Great Britain, 208.

A world's fair has two uses. It affords an opportunity for gratifying the curiosity of the layman. On the other hand, it gives the experts a chance to make comparisons between the different countries in the matter of development along certain lines. Europe has had plenty of indications recently of the growth of the United States from a great agricultural country to a great manufacturing country as well. We have been capturing foreign contracts that would have been regarded as out of our reach a comparatively short time ago. American rails are on English streets. American cars are on English railroads. American bridges are spanning English rivers. No wonder the British manufacturers have grown anxious as to what the future will bring forth. For our industrial future is complicated by no misgivings induced by a

failing coal supply. We have only begun to have some idea of the immense resources of the country in this as in other respects. There is no reason to believe that the progress of this nation will be less rapid in the next ten years than it has been in the last decade. And if it is not we shall outstrip all competitors in an unmistakable manner. It must not be forgotten that if we have proved our superiority in material matters we have held our own in non-material. In the world of sport, too, where it is a question of muscle in combination with intelligence, or intelligence in combination with something else, the Stars and Stripes have not been lowered.—*New York Sun.*

Building the Pressed Steel Car.*

You are probably all familiar with the manufacture of steel cars, to a greater or less extent. The steel, after coming from the steel yard, goes into the shearing department, then to the pressing department, then to the punching department, and then into what is called the construction department. In this department the floors, ends and sides of the cars are assembled and riveted together, all the machine rivets being driven here. Then these parts go into the erection shop, where they are fitted together to form the car and finally hand riveted.

In the shearing department are shears of various sizes, kinds and capacities. However, most of the work is that of shearing plates, which seldom run thicker than ¾ of an inch. The special feature of this department is the various odd shapes that have to be cut; and many problems arise of laying out on a flat surface the shape of a complicated pressed piece. This will require some modification of the ordinary way of developing solids as given in text-books on descriptive geometry, due to the stretching of the piece; especially when the piece is to be pressed hot. These shapes involve many special shear knives, made with proper curves and offsets, as many of the cuts are impossible on the ordinary shear. Some pieces after pressing are trimmed by the shears; but a very great number are of such shapes that it is impossible to do this after once being pressed. Hence you can see the importance of getting the flat blank correct to start with. In the Fox Pressed Steel Company's works, in England, I noticed that they had several special machines and heads for shearing pressed shapes that the ordinary plate or angle shears would not catch. This, however, is an unnecessary operation, even from a standpoint of looks, as these pieces so trimmed were not seen when in position on the car; and illustrates the fact that the

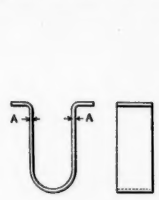


Fig. 1.

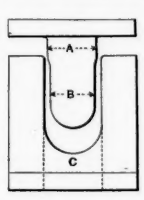


Fig. 2.

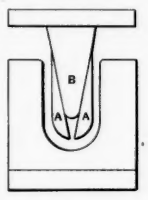


Fig. 3.

English devote more time to the finish of machinery than we here in America think necessary.

In the pressing department, which is perhaps the special feature of the business, there are hydraulic presses of all sizes and capacities, from 30 or 40 tons up to 800 tons. Very important factors in pressing are the dies or forms between which the piece is shaped. These dies are always made in two portions, the upper half being bolted to the top plate of the press and the lower half to the bottom. Naturally, from the work done these dies vary in size from the small ones of a few inches to those that measure 10 or 15 ft.; most of them are made of cast-iron, and many have hard steel wearing strips that can easily be replaced when worn by the rubbing of the pressed pieces. Some of the work done on these presses is done with the piece cold. Other shapes are such that it is impossible not to tear the piece unless it has been heated to a red heat. Some shapes are such that two, three or more pressings by different dies are necessary, each operation bringing the piece a stage nearer the shape desired. In hot work the dies expand and contract; a die 8 ft. long will expand something like ⅞ of an in., and it is of course necessary that the dies be at the proper temperature, independently of what may be the temperature of the piece, so that here comes in a little complication and this point must be watched closely in order to obtain satisfactory results.

Another point in this connection is the stretch of the pressed piece. The best way to make this clear will be to take an example of a piece as in Fig. 1. The steel used in this piece is ¾ in. thick with a width of 6 in. At the points "A" the thickness will be diminished about 1-16 in., and as you caliper down from this point the thickness gradually increases to ¾ in. The top flanges will show no appreciable stretch. The total length of the steel—about 60 in.—will stretch about 4 in., so that the piece will be cut 4 in. shorter than the figured length would indicate.

The sketch, Fig. 2, shows the outlines of the top and bottom dies. The top die has an increase in width of ⅛ in. at A, over that at B; otherwise there would be a hump at these points on the inside of the pressed piece. The sides of the lower dies are straight. There is often trouble with the pressed pieces sticking to the dies and giving a distorted piece after it is pried out with pinch bars. On all large presses a false bottom is employed to overcome this. This is a movable piece for the bottom of the lower half of the die. In Fig. 2, the dotted lines shown on the lower die would represent the sliding surfaces, the whole portion C raising and thus pushing out the piece. This is actuated by a small piston inside the large piston of the press. Thick oil is also a help and has the advantage of saving the wear on the die. In hot work it burns on the piece, helping to keep the proper temperature while the piece is being adjusted to the gages. Sometimes dies are constructed as shown in Fig. 3, still using the shape shown as an example. The upper portion of the die being made in three pieces, the portions A sliding on B, the wedges thus release as soon as the press is lowered.

Presses are also much utilized for gang punching, shearing and slotting. In these operations the same methods are pursued, the dies being constructed to hold punches or shear knives. Many odd-shaped blanks are cut out complete at one stroke. It would be hard to say what maximum number of holes could be punched at one stroke, but if the punches are made in different lengths, it allows an even distribution of pressure throughout the stroke. Thus by proper adjustment of this lead of one punch over another, according to the number of punches used, the maximum capacity of the press can be reached. The same may be said of the shearing, the proper angles being given to the knives.

If an ordinary steam engine indicator, with the proper reducing valve, be attached to the cylinder of the press, and a rig attached to the movable press plate, a card diagram will show the general results obtained when a single straight flange is turned up on a plate. The line A A, Fig. 4, is the atmospheric line and the height *a b* shows the pressure required to lift the press and with it the lower die and plate to be pressed on it. From *b* to *c* the press is steadily moving upward, and at the point *c* the material is engaged between the dies. From *c* to *d* the piece is being flanged, *d* being the point where the flange has gone through 45°. This, of course, will be the maximum pressure required, and from here on the pressure falls to *c*. At *e* the two dies come together and the full accumulator pressure is obtained, thus carry the line to *f*. The moment the press is released the pressure falls to *g* and the press runs down to the point *h*, the line *gh* being at a greater pressure than *ab*, for at this time the false bottom is forcing the piece out of the die, *h* being the point at which the false bottom valve is closed. The line *i* then returns to *a*, the press falling under the action of gravity, and the line *i* being slightly lower than *cb* as the exhaust water's friction in the pipes is overcome

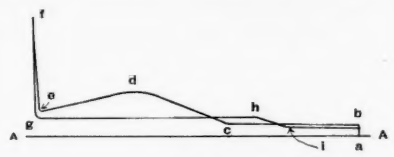


Fig. 4.

by the weight of the press only. From a study of this card it will be seen that the high pressure at *f* was not a necessary condition to do this work, that at *d* being all that is absolutely required. By practice and experiment it has been found, that while some pieces of pressed work will require the full accumulator pressure, a very large number do not, as in the example taken above. Consequently if a device can be obtained, by means of which we can obtain a higher pressure than the accumulator has, it will be a saving in many ways. This is done by means of an intensifier, under the press, operated on the principle of differential areas. To go back to our indicator diagram, *d* would represent the accumulator pressure and *f* the pressure after the intensifier has been thrown in. The theoretical gain will be immediately apparent, for in one case the steam pumps must keep the water pressure constantly at *f*, while in the other the accumulator will aways be up at the pressure shown at *d*. Other advantages in the way of having less pressure on the main pipe lines, less friction, etc., are readily seen.

Leaving the pressing department, the steel goes to the punches. Some few special machines are used, but mostly the ordinary single punch. The templets by which the position of the hole is marked on the piece are of the ordinary bridge type, and made generally of wood. As there must always be slight variations in pressed pieces, the ideal templet would be a flexible one, that would fit the piece closely under all conditions. If a material could be obtained like fairly hard rubber it would be just the thing. Attempts at hinging and jointing templets have so far not proved very satisfactory.

The greater number of riveting machines are actuated by hydraulic power, but air is also used. Many pneumatic hand riveters, chippers and reamers are necessary. In the erecting shop the large parts of the cars are fitted together by night and riveted by day, a gang leader and gang being required to fit a certain number of cars ready for the gang and leader who comes on in the morning to do the riveting, thus taking 24 hours to complete a car. I might state here that all work of all descriptions is done by piece work.

* Extracts from a paper by Sumner B. Ely, June meeting of the Engineers' Society of Western Pennsylvania.

Russian Railroads.

There were 3,190 miles of railroad opened for traffic in Russia in 1899, of which 666 miles was on the Siberian Railroad, 432 miles were extensions of what heretofore has been called the Trans-Caspian Railroad, now known as the "Central Asian," while 137 miles more of the branch of the Trans-Caucasian Railroad from Tiflis southwest to Alexandropol, towards the Turkish border. Thus there were 1,235 miles opened in Asia, which is two fifths of the whole. The number of passenger journeys was 6 per cent. greater in 1899 than in 1898, yet did not average one per inhabitant. The tons of freight carried increased 8 per cent. The gross earnings increased 6½ per cent., but the earnings per mile decreased 1½ per cent. Some of the European lines had large earnings per mile, one about $45,000; a long one from Moscow southeast, $32,400, the Warsaw & Vienna road, $29,400, and the St. Petersburg & Moscow, $26,200. There was an increase of nearly 4 per cent. in the freight shipped by water. More than half of these water shipments were on the Volga, where they amounted to 17,506,000 tons.

The Russian Government has ordered the surveys for three new railroads in the Ural Mountain district, which has valuable mines, many of them worked for a century or more. The production of these miles, except iron mines, however, has generally decreased within the last ten years. The production of iron increased more than 50 per cent. to 780,000 tons, but as it depends chiefly on wood for fuel, and the forests near the mines are getting thin, a considerable further increase will depend on bringing the ore and coal together by rail. Other mineral products of the Ural are copper, now much less than formerly, coal (380,000 tons in 1899), salt, gold (now in small quantities), and platina, of which the Ural produces 95 per cent. of the world's supply, yet in 1899 only 13,176 lbs. This is worth nearly $200 per pound; the production of it has doubled since 1890. The proposed railroads, which can bring coal from the Ural itself and petroleum from the Caspian to the mines, will, it is thought, greatly stimulate mining.

Fusible Plugs in Crown Sheets.

At the August meeting of the Pacific Coast Railway Club this question was brought up for topical discussion:

"Has the discontinuance of the use of fusible plugs for the crown sheets of locomotive fire-boxes become general on American railroads? Have there not been several instances in which the destruction of locomotive boilers, causing loss of life, might have been avoided had the use of fusible plugs not been abandoned?"

In answering this question, "from the standpoint of an engineer," Mr. R. S. Goble, Road Foreman of Engines, S. P. Co., said the use of fusible plugs has been discontinued in some places; whether generally so, I am unable to inform you.

Notwithstanding the theory that boiler explosions are invariably the immediate results of low water it is the consensus of opinion among mechanical experts that they are almost never so, which should effectually dispose of all claims of the fusible plug to pre-eminence as a life-saving device. Locomotive engineers, as a rule, object to the presence of the soft plug for the reason that it reduces the already proscribed limit to which low water can with safety be carried, and also from its reputation for occasionally melting out, with a full supply of water in the boiler, disabling the engine and subjecting the engineer to the imputation of carelessness or incompetence, of a form which long custom has classed as most disgraceful and humiliating. While I have never given full credence to this latter contention, it is nevertheless quite possible for a scale to form over the top of plug of sufficient thickness to effectually exclude the water and thus permit the fusible filling to be melted out, but in such an event the same scale should be sufficient to prevent the escape of water. It is also possible that the composition of the filling in these plugs may sometimes be such as to fuse at a lower temperature than necessary. It is this reputation for creating trouble without sufficient cause, together with its tendency to become scaled over, thereby nullifying the effect of its fusibility and rendering it inoperative when required for active service, which has led to its condemnation.

If fusible plugs are to be used it would seem proper to first adopt a plug designed to exert the greatest holding power over the fusible filling, while in a solid state, at the same time providing for a free opening to the fire on its melting; then select a composition for the filling in accordance with the requirements of the pressure carried, and then compel a systematic periodical examination once in six months, once in three months, or every ten days if the scaling propensities of the water demand it, having the plug taken out, all scale removed, the fusible filling examined, and if not found intact, removed, and plug replaced, all of which would require but a few minutes provided standard plugs of a single size were used, extra ones provided to replace those found defective, and put up with graphite to prevent corrosion of the threads.

Mr. J. J. Malone, Boiler Shop Foreman S. P. Co., said: I know of a great many railroads that do use them and of some that do not. All steam boiler insurance and inspection companies advocate the use of fusible plugs and in some tight boilers absolutely refuse to take the risk unless the fusible plugs are in. My opinion is that the discontinuance of the use of the fusible plug is not general on American railroads.

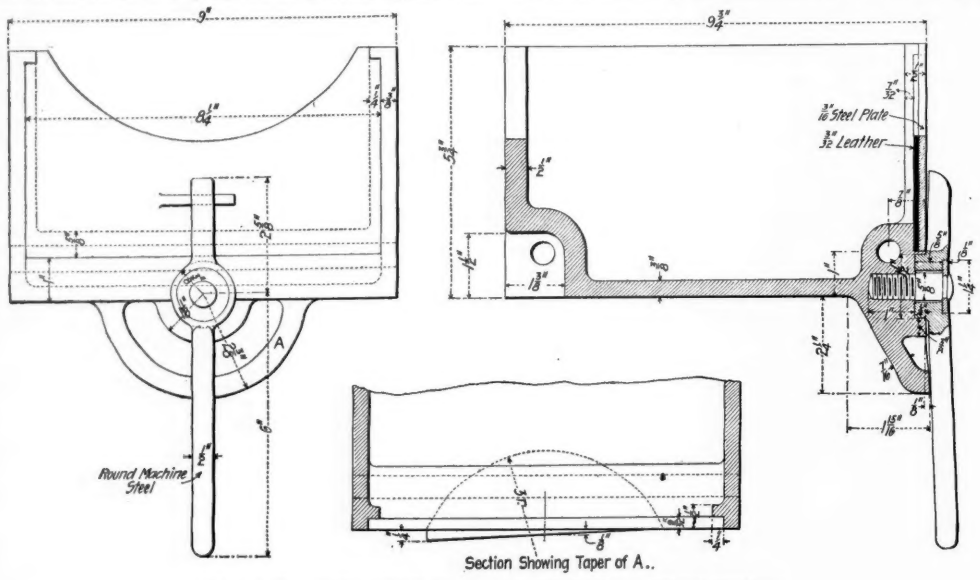
I do know of several instances wherein the use of fusible plugs would have saved damages done to fire-boxes. These plugs will run in good water a long time without injury, and in bad water they may be used provided they are looked after and cared for, as unless so cared for a scale will form on top and let the contents of the plug out when there is sufficient water. I am an advocate of their use and believe that it would be a good idea to

use fusible plugs for the crown sheets of locomotive fireboxes, provided that in bad water they are looked after and cared for often and renewed before scale would be heavy enough to injure them.

An Improved Driving Box Cellar.

In the discussions at the recent meeting of the Traveling Engineers' Association (*Railroad Gazette*, Sept. 21) an improved driving box cellar used on the Plant System was mentioned. Mr. W. E. Symons, Superintendent of Motive Power, has sent us drawings of this arrangement, from which the illustration is made.

To those who have wallowed, on the main line, in a few inches of snowy slush, under a modern, closely-built locomotive, while trying to draw cellar bolts that would not be drawn, and to remove impossible babbitt and renew inaccessible packing, Mr. Symons' device will seem a public benefaction. To the inspector in the roundhouse, and the mechanic in the pits, it must likewise appeal. In



Driving Box Cellar With Removable Wall-Plate—Plant System.

addition to the illustrations, little is needed to make the idea clear. It is simply a removable end-wall, made as an independent part of the cellar. It is made of a 3-16-in. steel plate faced with leather 3-32 in. thick, thus forming a leather-packed joint, the height of the packing line, below the journal. This plate and gasket are locked against the cellar side-walls by the bevel-lugs and lever shown, the side-walls of the cellar being formed to receive and retain the plate, vertically and laterally.

This is a commendable attempt to deal intelligently with a much neglected and costly source of delay and vexation, and we see no apparent reason why this device should not meet the requirements. There come to mind, readily, instances where the resource here shown would have shortened to 5 minutes, delays of 20 minutes or an hour, on fast trains, the movement of which is worth many dollars an hour.

Foreign Railroad Notes.

In 1875 the Turkish Government completed the construction of a railroad from the port of Mudania, on the Sea of Marmora, to the important town of Brussa, at the foot of Mt. Olympus, 26 miles. The rolling stock was put on, and then road and rolling stock were left to rust; no trains were run. Brussa continued to send its goods to sea by camels and carts, and no attempt was made to earn any interest on the $1,600,000 which the road had cost. It has never been known why the road was so abandoned. Eighteen years later, as Geo. Nagelmakers, the founder of the International Sleeping Car Co., was driving to Brussa, he discovered this railroad which he had never heard of, with rails rusted, ties rotten, and bridges in part fallen down. After inspection he offered to buy it of the Turkish Government, and his offer being accepted he repaired, or rather rebuilt, it, and in 1894 began working it. The traffic is light, but it earns something more than its expenses, and if it had been worked from the time it was completed it would doubtless have been of immense benefit to the country on its line, and yielded a considerable amount to the Turkish treasury indirectly in taxes on increased wealth, if not directly in net earnings.

The Austrian State Railroads are about to revise their freight rates so as to increase earnings. The traffic has increased under the old rates, and the gross earnings to some extent; but the working expenses largely, and the State Railroads have never yielded a reasonable interest on the money invested in them. The authorities have announced that they aim to make few changes in ordinary rates, but will try to confine their advances chiefly to the special rates which have been granted to certain industries, and which are generally lower than the rates on the same freights over the private railroads, so that shippers over these private railroads complain that competitors who can use the State Railroads have an unfair advantage.

The Stresses in Arch Bar Frames.

BY GEORGE I. KING.*

For the reason that a large class of your readers may be interested in the following discussion of the stresses developed in arch bars for diamond frame trucks, the writer is pleased to submit for general review the results of his investigations concerning a most important subject, and one that has apparently received but slight attention at the hands of car builders and such railroad officials as are interested.

With several preliminary assumptions that are necessary, we shall proceed to examine into the conditions of arch bar stress met with in the case of a 50-ton car with center of gravity, say 72 in. above the rail, and equipped with diamond frame trucks of the usual type, deriving certain results as we progress that will afterward be considered in comparison with other results, and in the light of experience.

It is, of course, essential to proportion all arch bars to withstand safely the maximum stresses to which they are subjected in actual practice, and to this end it is at once apparent that both horizontal and vertical forces must be considered as acting simultaneously, and with the greatest effect consistent with stability of the car upon the rails.

It is therefore pertinent to consider the structure in relation to the track as shown in Fig. 1, where, if the rails be taken in a horizontal plane for maximum effect, it is seen that the resultant of the horizontal and vertical forces acting at the center of gravity of the loaded car is made to fall 6 in. within the assumed points of contact of the left hand wheels and rail; this distance of 6 in. is taken for two reasons; first, because anything much less would make the equilibrium of the car upon the track quite unstable and its operation dangerous; second, as will be pointed out below, the fractional horizontal component of 14,055 lbs. acting at the center of gravity of the car in Fig. No. 1 is ¼ the assumed total horizontal force acting at this point, and therefore H, which equals 56,220 pounds, may represent the centrifugal force due to moving the car at a speed of 36.5 miles per hour over a 24° curve of 240.5 ft. radius, assuming the total weight of car and load above the axles to be 152,000 lbs. For any class of equipment this speed on a 24° curve with no elevation of the outer rail is altogether excessive, and should fairly represent actual maximum conditions.

Since the case under consideration is taken to be a 50-ton car, it is desirable to design the arch bars to carry a total static load of 152,000 lbs. per car, or 38,000 lbs. per axle, which was the basis for proportioning the Master Car Builders' standard axle for 100,000-lb. cars. Observe, that it would be proper to deduct 1,000 lbs. from this total load to account for the weight of journal boxes and contained parts carried directly by the axles, but the error due to the omission is on the safe side, and may be neglected.

Referring now to Fig. 1, which illustrates the relation of forces for any one axle only, it should be noted that on a level track, and with the average amount of wear of parts, the center of gravity of the car and load may be, and under the given conditions would be, displaced laterally about 4 in. from its true normal position under the action of the maximum horizontal and vertical forces, and the details of this transverse movement are there set down as a fair illustration of actual results.

Let W = total vertical pressure on any one axle, including allowance for vertical oscillation and impact.

H_4 = ¼ horizontal force due to curves, switches and wind pressure; or to curves alone.

V_2 = vertical component reaction at any one support for left-hand arch bar frames.

H_1 = horizontal component of the same reaction.

V_2 = vertical component reaction at any one support for right-hand arch bar frames.

H_2 = horizontal component of the same reaction.

We have already taken the lowest center of gravity point of the loaded car to be 72 in. above the rail; therefore, both the horizontal and vertical forces acting upon the car body will be found to intersect about 53 in. above the reaction points for the arch bar frames, which points are assumed to be 19 in. above the track. This, it should be noted, is a more or less arbitrary selection, but is believed to be as close to the actual conditions as it is possible for these to be determined.

It is seen from Fig. 1 that for any one axle the proportional resultant of the horizontal and vertical forces acting at the center of gravity of the car, is a force F_4 acting downward and to the left, and with its line of action intersecting the horizontal through the rail contacts at a distance of 6 in. from this left hand point. In order to determine the horizontal and vertical components of the arch bar frame reactions, it is necessary to assume that these reactions are parallel to the fractional resultant F_4 acting at the center of gravity of the car. It should be observed that this is a condition that may or may not actually exist, but in view of the uncertainty involved, and since this assumption is believed to provide as large reactions as are obtained in practice, it is made because in other respects it furnished the most satisfactory solution of our problem.

From investigations published by the Master Car Builders' committee charged with the design of an axle to carry 31,000 lbs., report of which is to be found in the proceedings of the Association for 1896, it is assumed that the maximum possible value of

$$V_1 = \frac{38{,}000}{2}\ (1.984)$$

= 37,700 lbs. for an axle designed to carry 38,000 lbs. In other words, the maximum vertical pressure on any one journal = 98.4 per cent. more than the static load on that journal, provided the same conditions apply to 50-ton cars as to 30-ton equipment, and in the absence of definite information to the contrary, we shall assume that they do so apply.

Since the arch bar reactions are assumed parallel to the resultant F_4, we have a series of similar triangles representing all the forces acting, and are thus enabled to readily determine the relation of V_1 to H_1, and V_2 to H_2. Now $\frac{H_1}{V_1} = \frac{19}{72}$; therefore maximum H_1 = 37,700 (.267) = 10,000 lbs. approximately.

Having thus found the horizontal and vertical components of any one of the left hand reactions, we are enabled to easily ascertain the remaining right hand components from the necessary conditions for equilibrium, whence a simple calculation shows that H_2 = 4,055 lbs., and V_2 = 15,290 lbs., while F_2 = 15,800 lbs.; likewise F_1 = 39,000 lbs., and therefore F_4 acting at the center of gravity of the car = 54,800 lbs. (for one axle).

We have now derived the horizontal and vertical components of the greatest and least arch bar reactions consistent with safe operation of the car, and it only remains to ascertain the maximum stresses in the several members and thence proportion the parts to withstand the loads thus found.

No direct solution of the problem is possible without assuming some approximate arch bar section, and to this end we have selected a 5-in. special channel, made by the Cambria Steel Company, and known as their "Cambria 5-in. arch bar channel." From the stress diagram Fig. 2, which is drawn to scale, and represents the contour of an average arch bar frame with 5 ft. 2 in. wheel base, it is possible to take off at once the stress in the tension bar 1-5 = say 38,000 lbs. If 1¾ in. column bolts are used, which are considered more than sufficient for the case under discussion, the net area of the given section about these holes = approximately 4.19 sq. in., consequently $f_1 = \frac{38{,}000}{4.19}$ = 9,070 lbs. per sq. in.; in other words, the maximum uniformly distributed stress over the net section in the left hand bottom bars due to the vertical component V_1 only, is about 9,070 lbs. to the sq. in.

It now remains to consider the maximum horizontal bending moment resisted by one entire left hand set of arch bars with their tie bar, and caused by the horizontal component of 10,000 lbs. that is assumed to act at a distance of 23 in. from the column bolt holes. (See Fig. 3.) It should be noted in passing that this moment arm of 23 in. is actually a more or less variable length, but it is thought to be an instance of the average conditions to be met with for a 62-in. wheel base. Considering now this horizontal reaction component of 10,000 lbs., it is seen that the bending moment at the column bolt holes 23 in. distant = Mh = 23 (10,000)

= 230,000 in. lbs. But it is clearly evident that this horizontal bending moment is resisted by the combined strengths of the top and bottom arch bars and their tie bar (arranged as shown in Fig. 4), and from details of the sections illustrated in Fig. 4, we find for a vertical axis,

$$I = 35.4 \text{ and } S = \frac{I}{y} = \frac{35.4}{2.5} = 14.2;$$ therefore $$fm\ 1 = \frac{230{,}000}{14.2} =$$

16,200 lbs. per sq. in., which is the maximum compressive stress on the innermost fibers, and the maximum tensile stress at the outermost fibers, for all the bars in any left hand frame, due solely and alone to the horizontal component of the end reaction. For the left hand tension bars 1-5 therefore, we may combine the stresses due to both horizontal and vertical forces, and thus find the final maximum fiber stresses per sq. in. at the weakest section of each bottom bar; that is, f = 25,700 lbs. per sq. in. tension, and 7,130 lbs. per sq. in. compression: or, in other words, for the left hand lower arch bar members, 1-5, the outermost fibers at the weakest section are subjected to a tensile stress of 25,270 lbs. to the sq. in., while the innermost fibers resist a compressive stress of 7,130 lbs. per sq. in., in the reverse manner.

Considering now the arch bar frames on the opposite

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or right hand side of Fig. 1, for the uniformly distributed stress due to the vertical reaction only, we have $f_r = \frac{15,400}{4.19} = 3,680$ lbs. per square inch; also for the horizontal bending moment resisted by the combined strengths of the right hand arch bars and their tie bar we have $f_{mr} = \frac{93,265}{14.2} = 6,570$ lbs. per sq. in.; or, in other words, for the horizontal component H_2 acting on any right hand frame, the maximum compressive stress on the outer fibers at the weakest section of all bars = 6,570 lbs. per sq. in., while the maximum tension at the inner fibers equals the same amount.

Referring now to the right hand bottom bars 1-5, we find the combined maximum tension on the inner fibers is 10,250 lbs. and the maximum compression on the outer fibers = 6,570 — 3,680 = 2,890 lbs. per sq. in.

Considering yet Fig. 5, which shows the alternations of stress from tension to compression and vice versa, for the lower members of both sets of arch bars for each truck, we see that for either the right or left hand tension bars 1-5, the maximum fiber stress must alternate at the column bolt sections, from + 25,270 to — 2,890 on the one side and from — 7,130 to + 10,250 on the other side, as the car swings first in one direction and then in the other.

Note now the following formula for repeated alternations of stress derived from the investigations of Wohler, and expressed for soft steel as follows: $a = 34,000\ (1 - .47\ \frac{\text{least stress}}{\text{greatest stress}})$ = ultimate strength per sq. in.; whence we find a = 22,780 lbs. per sq. in. equals maximum safe strength for alternations of stress between given limits of + 10,250 to — 7,130; and again a = 32,300 lbs. per sq. in. equals maximum safe strength for alternations of stress between limits of — 2,890 and + 25,270. Since the maximum stresses found in the bars 1-5 are well within the limits of 22,780 lbs. in the one case and 32,300 in the other case, it is safe to assume that the given steel channel section is amply sufficient to serve as the tension members of these arch bars frames; that it is unnecessary to consider the stress in the inclined portions of the tension bars is at once apparent from the fact that the total uniform load in the left hand members 2-4 and 6-7 is but 49,000 lbs. distributed over an area of 5.55 sq. in.; whence the maximum uniformly distributed stress per sq. in. in these parts of the bottom bars, arising from the vertical loading only, is approximately 8,830 lbs. as against a similar stress per sq. in. of 9,070 lbs. for the net section at the column bolt holes in the horizontal portion 1-5. The stresses due to the horizontal component, being also distributed over the gross section of the bar 2-4 and diminishing uniformly from a maximum at the lower end to zero at the upper end, are at the most somewhat less than the corresponding stresses at the column bolt sections of the horizontal parts 1-5, and consequently the sum of all the stresses in these inclined bottom members is necessarily less than those in the horizontal portions, and need not be further considered.

For the top members, or compression bars, the conditions are as follows: At the column bolt sections the stresses per sq. in. are identical in amount with similar data for the lower bars, except that the maximum compression is 25,270 lbs. at the inner fibers, while 7,130 lbs. tension per sq. in. is found at the outer fibers of each left hand bar; consequently, if the bottom bars are sufficiently strong at their weakest sections, identical conditions for the top bars imply equal strength about the column bolt holes.

For the inclined portions 3-4 and 3-6 of the top members, the usual column formula will apply, and since here $\frac{l}{r} = 3$ nearly, for the given 5 in. section, a safe ultimate strength of 25,000 lbs. per sq. in. for mild steel could well be used, whereas the actual uniformly distributed stress per sq. in. arising from the left hand vertical loading only $= \frac{38,500}{5.55} = 7,000$ lbs. compression. Of course, to this must be added the additional compressive stress varying from a maximum at the column bolt sections to zero at the journal boxes, and due to the horizontal components of the end reactions, as in the case of the inclined portions of the tension bars. In no case, however, can this total stress exceed the limit just fixed, and this remark is equally applicable to the remaining horizontal portion 3-5 of the top bar between the column bolts themselves.

Concerning the tie bars, it is very difficult to even approximate the stresses in these members, for the reason that the indeterminate rigidity of the arch bars about the bends at the inner sides of the journal boxes prevents any calculation of value as to the real turning moment the tie bars actually resist, so that in this instance, as in some others, we are compelled to fall back upon the results of past experience. Fortunately, however, this is a matter of secondary importance since the arch bars themselves are treated as the main members of the frames, and are mainly relied upon to carry the load.

The question naturally arises, of what use is this arch bar calculation in actual practice? To answer it, the reader has but to investigate the efficiency of plain rectangular arch bar sections in comparison with the channel shapes herewith presented, in order to find a wide disparity between the relative strengths and weights of the two kinds of sections. To emphasize this point, it is pertinent to investigate the state of stress met with in the case of the Master Car Builders recommended practice arch bars adapted to 40-ton trucks, where the total axle capacity is 31,000 lbs. each, or 124,000 lbs. per car. With the same gage of track and location of center of gravity as above, we find for a 40-ton car, $V_1 = 30,750$ lbs., while $H_1 = 8,200$ lbs., and if the arch bars have the same set as for the 50-ton truck just considered (which is essential for comparison), the direct stress in the left hand tension bars 1-5 = 31,000 lbs. approximately, distributed over a net area of 3.87 sq. in., whence f = 8,000 lbs. per sq. in., very nearly. The bending moment due to the force H_1 acting at a distance of 23 in. from the column bolt holes = 188,600 in.-lbs., and from well known details of the several standard sections (Fig. 6) it is seen that S = the moment of resistance of one entire set of bars about a vertical axis = 11.2; whence the maximum compression on the inner fibers of the left hand frames equals 16,850 lbs. per sq. in., while the maximum tension on the outer fibers equals the same amount; combining the stresses due to both horizontal and vertical loading, it is seen that the maximum tension on the outer fibers of the bottom bar 1-5 at the column bolt section = 24,850 lbs. per sq. in., while the maximum compression on the extreme fibers of the inner surface = 16,850 — 8,000, or 8,850 lbs. per sq. in. A comparison of these stresses with those obtained for the 5-in. channel section discussed above will show a practical agreement between the two, or if there be any difference in strength, it is apparently so slight as to be entirely negligible. But observe, that whereas the Master Car Builders recommended practice arch bars when made of *iron* weigh about 1,433 lbs. per car (including tie bars), the total weight of the 5-in. steel channel section (including tie bars), as considered in the case of the 50-ton car, is only 1,321 lbs.; in other words, the channel arch bars under the *50-ton* equipment weigh 112 lbs. per car less than the rectangular members in the *40-ton* trucks, and this without any greater stress per sq. in. in the one case than in the other.

As yet no standard arch bars of plain rectangular sections have been recommended for 50-ton cars by the Master Car Builders' Association; but it is fair to presume that if future shapes of the Association are increased proportionately for the greater capacity cars, the difference in dead weight per car between the 50-ton Master Car Builders' arch bars and the 5-in. channel section herein discussed would surely be not less than 275 to 300 lbs., with probably no increased strength or safety.

At first sight it might not be apparent why the 5-in. channel shape is so much more efficient than the 4½ rectangular section of greater gross and net area; but consideration of the fact that the maximum stresses set up in all arch bars are probably due to horizontal forces rather than to vertical loading, will readily suggest the reason for the greater value of the wider bars, particularly where these are provided with heavy flanges, as is the case with the Cambria channel considered above.

cussing is a most complex and difficult matter to handle

The writer realizes that the subject he has been disintelligently, and for this reason he particularly desires to emphasize the fact the analysis outlined above should be used only for making comparisons of proposed sections with such as have been found to stand the test of actual experience, and in addition, to get some idea of the actual maximum stresses to which it is possible to subject the different members of the arch bar frames so long as the car remains upon the track. If he shall have accomplished either purpose he will feel that his labor has not been entirely in vain.

Detroit, Sept. 26, 1900.

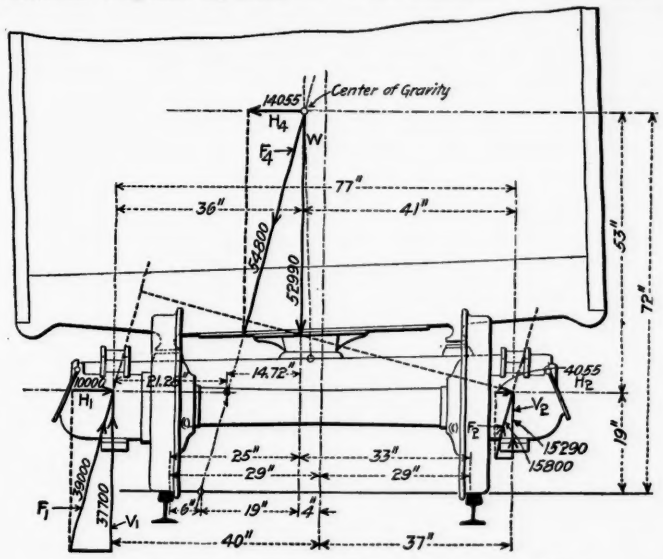

Fig. 1.—Lateral Displacement of Center of Gravity Due to:

(a)	Wheel flange traverse	⅜ in.	
(b)	End wear of axle collar	⅛ in.	
(c)	End wear of brass plus clearance	¾ in.	
(d)	Lateral movement of bolster	½ in.	
(e)	Side bearing clearance eliminated	½ in.	
(f)	Canting of truck bolster due to spring compression	1½ in.	
	Total lateral displacement of center of gravity	4 in.	

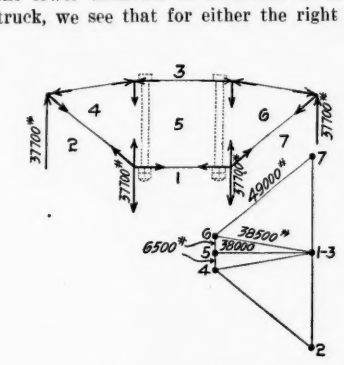

Fig. 2.

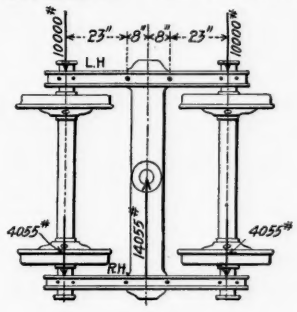

Fig. 3.

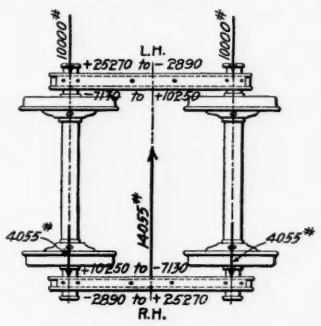

Fig. 5.

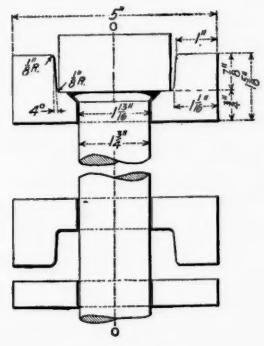

Fig. 4.

Fig. 4.—Gross area section	5.55 sq. in.
Net area tension bar	4.19 sq. in.
Net area compression bar	4.13 sq. in.
Weight per foot (steel)	18.87 lbs.
Weight per foot (iron)	18.50 lbs.
I_0 tension and Compression bars } average each	14.6
I_0 tie bar	6.2
Total I_0 all sections	35.4
Section modulus all sections	14.2

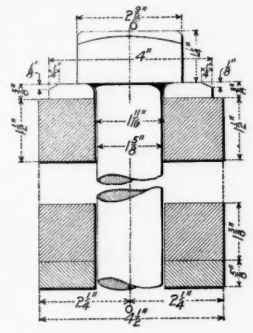

Fig. 6.

Fig. 6.—Gross area tension bar	6.19
Net area tension bar	3.87
Weight per foot (steel)	21.04
Weight per foot (iron)	20.63
Gross area compression bar	6.75
Net area compression bar	4.22
Weight per foot (steel)	22.95
Weight per foot (iron)	22.5
I_0 of compression bar	10.73
I_0 tension bar	9.99
I_0 tie bar	4.46
Total I_0	25.18
Section modulus of all sections	11.2

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

There were noted in our news columns, during the month of September, orders for 5,986 cars of all kinds and 95 locomotives which is somewhat below the records for August, when orders for 6,175 cars and 129 locomotives were noted. The car orders are divided as follows: Box, stock and refrigerator cars, 3,075; coal and ore cars, 2,070; flat cars, 515; tank cars, 25; steel cars, 95, and passenger cars, 206. Of the locomotives, 28 were for export.

Last week the announcement was made by the President of the Baltimore & Ohio that that company had ordered from the Pressed Steel Car Company 6,000 cars at an average price of $1,100. Four thousand of these cars are gondolas of 80,000 lbs. capacity and 2,000 of them are twin hopper cars of 100,000 lbs. capacity. This is a very extraordinary order, amounting in money to $6,600,000 and requiring over 90,000 tons of plates. Mr. Schoen is quoted as saying "the order is undoubtedly the largest ever given, and I would state that we have in the last eight days taken contracts for steel cars approximating in money value nearly $7,000,000." It is very likely that measured by money this is the largest single order for cars ever given. In number of cars and in carrying capacity, however, it is not. About a year ago the New York Central & Hudson River Railroad Company placed with the American Car & Foundry Company an order for 500 flat cars, 4,000 twin hopper coal cars of 80,000 lbs. capacity, and 5,000 box cars. The total of the nominal carrying capacity of that order of 9,500 cars was 325,000 tons. That of the Baltimore & Ohio pressed steel cars now ordered will be 260,000 tons. But the Baltimore & Ohio now places with the Pullman Company an additional order for 3,000 cars, and the sum of the two orders would make more tons capacity than the New York Central order. It is, however, a matter of very little consequence whether or not this is the biggest order for cars ever placed; the important fact is that it is placed. Other important facts are that other large orders have just been placed with the Pressed Steel Car Company, and that still others are under negotiation, and that railroad officers are telegraphing to the company to hold their places in the line. Further, we learn that steel makers in certain lines have withdrawn their quotations, and the air is full of rumors of great orders pending for rails and for bridges and structural shapes. It looks as if the turn in steel prices had come, and also as if people had made up their minds that Bryan is defeated already, and that they can go on and do business.

The Relative Economy of Stationary and Locomotive Steam Plants.

In another column are letters called out by our previous discussion of the relative economy of stationary and locomotive steam plants. In commenting on these, attention should first be directed to the introductory statement of our original article which sets forth the fact that comparisons of the sort attempted can only be made in very general terms. The letters in question depart from this principle. Both present discussions of conditions which are assumed to affect locomotive performance, and one gives data derived from individual engines that are plainly not of general application. For these reasons the letters are somewhat outside of the original discussion. Much that appears in them to be in criticism of our previous article, is in fact new to the discussion, suggested by a point of view quite different from that which we assumed and defined.

Dealing with the letters on their merit, we agree perfectly with Mr. Strong's proposition that a locomotive should be capable of working continuously at its rated power. The fact that such an engine may for short intervals of time carry a heavy overload does not affect the validity of this proposition. In assuming as we did that the average load of a locomotive would be half its normal load, we were influenced by the fact that conditions of service require every locomotive to make a large percentage of its total mileage under less than full power. A considerable percentage is run with the throttle closed and, hence, at no power, and a still smaller, but by no means negligible percentage, is run at terminals without trains. As in our comparison we had credited the locomotive with its full mileage, we thought it not unreasonable to make the assumption stated concerning its average power. If the estimate is too low for the locomotive, it could be argued with equal force that the corresponding estimate for the stationary engine, based on a similar assumption, is also too low. Our effort was to arrive at a value which for purposes of comparison would be fairly representative of both types of plants. We see nothing in Mr. Strong's discussion which indicates that we have in any way misapprehended the facts in the case.

In the matter of coal consumption, Mr. Strong implies that the limits for a simple engine, which we gave as from 4 lbs. to 7 lbs. per hour, should be from 6½ to 13 lbs. In this we do not agree. Such values are too high for all but exceptional cases and these we had no intention of covering. In choosing the limits of 4 and 7, we had in mind a report of results obtained from the Purdue experimental locomotive, presented to the Western Railway Club in May, 1896, which shows a minimum consumption of Indiana block coal of 4.18 lbs. Indiana block is regarded as a poor coal for locomotive use. With fuel of a superior quality, the same conditions of running would doubtless have given a minimum consumption as low as 4 lbs. An abstract of the data to which we refer is as follows:

Table I.—Coal per Indicated Horse-Power at Different Speeds and Different Cut-Offs. Throttle Wide Open. Boiler Pressure 130 Pounds. Brazil Block Coal.

Speed in Miles.	Revolutions per Minute.	Coal C'ns'mpt'n in lbs. when Cut-off is 6 inches.	8 inches.	10 inches.
15	81	4.45	4.19	....
25	135	4.19	4.45	5.08
35	188	4.18	4.54	6.32
45	242	4.53	5.60	....
55	296	5.12	6.03	....

While Mr. Strong believes our estimate of 4 lbs. of coal to be too small for a single expansion engine, he urges that our estimate for the compound is too high. The exact wording of our statement was that "the compound locomotive must have nearly 4 lbs. of coal per horse-power per hour," while Mr. Strong predicts that a locomotive will soon be designed which will give a horse-power on a consumption of coal of 2 lbs. an hour. It will doubtless be clear to the reader that our remarks applied to existing engines. We have no desire to define limits for the future. We should explain, however, that in leading up to the proposition already quoted, Mr. Strong presents some interesting indicator cards from which he argues that the water consumption of a properly designed compound locomotive using steam at 156 lbs. is no more than 20.5 lbs. and that had the steam pressure been as high as 225 lbs. the consumption would have dropped to about 18 lbs. However valid may be the conclusions, which are given to the second decimal place, we must protest against the method employed in reaching them. Engineers have long ago recognized the fact that indicator cards can serve no useful purpose in determining amounts of steam actually consumed by an engine. For example, Mr. Strong assumes an initial condensation of 10 per cent.; the actual condensation may have been either greater or less than this, with a strong probability that it was greater. Our belief is that values thus reached are entirely unreliable. Again, Mr. Strong is hardly fair to himself in his process of determining the probable performance of his engine, assuming it to have been provided with steam 225 lbs. pressure instead of 156 lbs. Thus, the actual card (156 lbs.) discloses a sloping steam line, and consistency requires that the card for the assumed condition of 225 lbs. should have a similar form. In the diagrams presented the steam line for the assumed card is parallel with the exhaust line.

We cannot refrain from calling attention to evidence which his letter presents of Mr. Strong's well known leaning toward the compound locomotive. Thus, the lowest coal consumption which he concedes to the simple engine is 6.5 lbs. which, with an evaporation of 6 lbs. would give an actual steam consumption of 39 lbs. per horse-power per hour, while his claim for an actual compound using 156 lbs. per hour is 20.5, making the comparative performance as disclosed by the figures given, very nearly in the ratio of 2 to 1. It is not often that advocates of the compound put forth a claim so significant. But, as has already been intimated, the real condition seems to be that the performance of the simple locomotive is much better than that with which Mr. Strong credits it. Thus, referring again to the Western Railway Club paper, from which we have once quoted, it will be seen (Table II.) that the actual steam consumption under a rather wide range of action may be taken as from 26.3 to 32 lbs.

Table II.—Pounds of Steam per Indicated Horse-Power per Hour at Different Speeds and Different Cut-Offs. Purdue Experimental Locomotive.

Speed in Miles.	Revolutions per Minute.	Steam Consumption when the Cut-off is 6 inches.	8 inches.	10 inches
15	81	28.9	27.7	....
25	135	28.1	26.6	28.6
35	188	26.9	26.3	30.1
45	242	28.6	28.5	....
55	296	30.6	32.0	....

For easy comparison with these figures representing the performance of a single expansion locomotive (Table II.) we give in Table III. the steam consumption of a compound locomotive engine as disclosed by a paper presented to the St. Louis Railway Club in 1898. It will be seen that the best performance reported for this engine, 20.9 lbs., approaches the performance which Mr. Strong estimates for his actual engine, which is 20.5. It would appear also that a consumption as low as 20 lbs. is not improbable for a compound locomotive, but we venture the prediction that reductions beyond such a limit will be difficult in locomotive service.

Table III.—Steam Consumption per Horse-Power per Hour, Vauclain Compound Locomotive Engine. Purdue University.

Revolutions per Minute.	Steam C'ns'mpt'n per I. H. P. per Hour, lbs. 10-in. Cut-off H.P.C.	11-in. Cut-off H.P.C.
100	23.7	28.7
170	23.1	23.3
230	22.9	21.7
270	22.7	20.9

Passing now from the letter of Mr. Strong to that of Mr. Hubbell, it would appear that the intent of his argument is to prove the advantage of an early cut-off. The argument has always been fascinating, but it is not always a safe guide. Data already quoted in Table II. shows that the earliest cut-offs do not give maximum efficiency. It is our understanding that it has been proved from a very large number of experiments on the Purdue engine that the most efficient point is always later than 25 per cent. of the stroke. As evidence that the locomotive is not peculiar in this respect, we give as Table IV. results obtained from a horizontal non-condensing Corliss engine tested at Creusot and quoted in the last edition of Peabody's "Thermodynamics." It will be seen that even in the case of the Corliss engine the steam consumption steadily decreases as the portion of stroke during which steam is admitted, is increased. Had the experiment been extended to include still later cut-offs, a point would have been found which if passed would have resulted in increased consumption. Illustrations of similar import with those presented may be readily multiplied. We have taken pains to develop this matter because we believe that the facts involved are too frequently misapprehended.

Table IV.—Steam Consumption per Horse-Power of a 21.7 x 43 in. Non-Condensing Corliss Engine.

Cut-Off, P'r C'nt of Stroke.	Approximate Steam Pressure.	Steam per H.P. per Hour, lbs.
13	100	28.4
17	100	26.8
20	100	25.8
16	75	27.6
18	75	26.7
26	75	24.6
32	75	24.2

In the way of added discussion, we should call attention to the close agreement in steam consumption of the locomotive and of the stationary engine, as disclosed by Tables II. and IV. The minimum for the simple locomotive is 26.3 and for the Corliss engine 24.2 lbs. There is nothing mysterious about the relatively high performance of the single expansion locomotive, the fact being as stated in our original discussion that such engines operate under conditions decidedly favorable to high cylinder performance.

Annual Reports.

Louisville & Nashville.—The remarkable development of the iron industry of the Southern States materially benefited the Louisville & Nashville in the last fiscal year for which the report is now at hand, that company's lines intersecting the mining districts of Northern Alabama and Tennessee very completely. The company's increase in gross earnings, therefore, was quite exceptional, being $3,982,000, or 12½ per cent., and giving the company a gross revenue of $9,225 per mile of road. This is a high figure for any company not working in the manufacturing districts of the Eastern States. Even the substantial Chicago & Northwestern reported gross of only $8,230 per mile in its last fiscal year, while the Burlington and the St. Paul earned respectively $6,252 and $6,397 per mile. This gain of the Louisville & Nashville is on an operated mileage of 3,007.

Gross earnings on this line directly operated were $27,742,380. Operating expenses were 67 per cent., against 66 1-5 per cent. in 1899, so that net operating revenues were $9,138,973, an increase of $1,111,074 for the year. Adding the profits from controlled lines, dividends and interest on securities owned, rentals, etc., amounting to $650,045 and deducting interest, taxes and other charges, including $387,601 for sinking fund unfunded discount on bonds sold, and surplus of the South and North Alabama, a controlled line, which is credited to profit and loss account, the company had a net income for the year of $3,619,235, against $2,626,900 in 1899. Four per cent. dividends were paid during the year on the outstanding capital of $52,712,520, against 3 per cent. last year, leaving a surplus balance of $1,507,234.

Of the increase in operating charges $2,872,000, or nearly three-fourths of the enhancement in net revenue, about half was due to maintenance charges. The higher cost of transportation, $1,354,000, was partly due to the increase of 15¾ per cent. in ton-miles and 3⅓ per cent. in passenger miles, but also to a large extent to the increased cost of coal and other supplies. Maintenance of way charges increased $634,000, and cost of maintenance of way $823,000, both these accounts including the cost of purely betterment work, in addition to renewals and repairs.

The report contains a list of betterments which, previous to 1895, when the construction account was closed, were charged to capital. These items foot up a total of $1,022,000 out of total maintenance of way expenses of $3,951,000. The increase is $503,000, as compared with last year. The largest items of improvements are $255,000 for 45 miles of side-track; $142,000 for new buildings, and $137,000 for bridging. The equipment account shows $1,430,000 spent for locomotive repairs, an increase of $242,739 over 1899, or 20 per cent. There was an increase of $102,145, or about 30 per cent., in passenger car repairs, and of $175,437, or 12 per cent., in freight car repairs. These figures include the cost of additional equipment purchased and for all cars and engines destroyed, whether replaced or not. The locomotive inventory shows a net addition of 15 engines, and 2,117 freight cars were added.

Great Northern.—The enlargement of stock capital, a feature of last year's annual report of the Great Northern, is also a part of the record of the year ending June 30 last. On July 1, 1898, Great Northern Railway had a capital of $25,000,000; it is now $100,000,000, including $1,000,000 set apart as available for subscription by employees, but not yet issued. This increase of $75,000,000 is not altogether a net addition to capital, much of it being issued in exchange for shares of subsidiary companies. During the past year the increase in capital stock was $9,000,000, of which $3,500,000 was for the purchase of $3,500,000 new stock of the Eastern Minnesota, issued by that company for extensions in Wisconsin and Minnesota, a steel grain elevator at West Superior, a new bridge across the St. Louis River at Duluth and for additional equipment, while the balance was to acquire new stock of the Wilmar & Sioux Falls, issued to purchase the Sioux City & Northern, 96 miles; the Sioux City & Western, 129 miles, and other new lines.

The additions of the year, amounting to 206 miles net, brought the mileage worked up to 5,202 miles on June 30 last. During the year the company operated an average of 5,046 miles, or 290 miles more than in 1899, and on this earned $28,910,789, an increase of $5,892,886. The largest share of this gain in revenue was absorbed in increased operating expenses, and particularly in larger expenditures for maintenance, this cost, accounting for $1,373,000 out of a total expansion of $2,713,000 in expenses. The income from operation was $13,042,413, expenses being 54½ per cent. of the gross receipts, as against 52⅓ per cent. in 1899. Altogether these figures represent much the most prosperous year in the history of the Great Northern, which may be taken as practically going back only to 1890, when it completed its transcontinental line. The gross earnings per mile from traffic were, for instance, for the first time above $5,500, being actually $5,696 per mile, while net earnings were $2,765 per mile. Both these figures, however, it may be worth while noting, fall below those of the Northern Pacific for the same period, which were $6,368 and $3,053 per mile, respectively.

The aggregate profits in 1900, that is, surplus from operating the Manitoba lines, the miscellaneous income, the dividends received on stock owned in subsidiary companies, etc., were $10,426,541. The dividends paid 5¼ per cent. on about $89,285,000 of shares, and 1¾ per cent. on $98,408,700 called for $6,408,778, which left a balance of $4,017,764 for the year, from which was deducted $1,800,000 for improvements, and also $600,000, being a second appropriation of that amount, toward the cost of the Cascade tunnel, whose completion the report promises for Dec. 1. The headings of the tunnel, it may be noted, met last week.

The income balance reported above compares with those of the other transcontinental lines as below: The Northern Pacific earned $9,483,819 on $155,000,00 stock; the Atchison, $9,739,305 on $216,199,530 stock, while the Union Pacific earned $7,954,063 from the operation of its own lines. Including the Oregon divisions, the available balance was $11,879,000 on the $194,910,000 outstanding Union Pacific shares. Great Northern's income includes a special account of $689,076 profit from sale of Oregon Railway & Navigation shares.

A large part of the text of the report is given up to a recital of the improvements carried out on the various lines and the new equipment added, capital account being largely charged for this betterment work, as well as current income. The capital expenditures, in fact, footed up $5,297,836. New equipment cost $2,021,443, of which amount $1,518,411 was made a capital charge. The new equipment included 3,061 freight cars, 35 passenger cars and 9 locomotives. Twenty-six additional locomotives ordered in the past year not received by June 30, have since been placed in service, and 1,250 freight cars are also being delivered on last year's contracts. A good deal of this equipment replaces old rolling stock, 31 light engines, for instance, having been disposed of last year.

Betterment work can be only briefly alluded to here. It included fencing 310 miles, building 7,700 feet of steel bridging, 26,300 lineal feet of bridges filled in, while relocation of line still further reduced the wooden bridging, the total reduction in this class of structure during the year being 37,580 lineal feet. In addition banks were widened and grade restored on 442 miles of line, of which 519 miles were ballasted, while at present 130 miles of the Wilmar & Sioux Falls are being regraded and gravel ballasted. On the main line in Montana 73 miles has been relocated to reduce grades, and this work is now in progress on 60 additional miles on different divisions. The amount of work done this year is much larger than in any previous year. Over eight miles of wooden bridges have been replaced by heavy steel construction or solid earth embankments. The cubic yards of earth moved is nearly equal to the grading of 500 miles of ordinary railroad.

Chicago, Burlington & Quincy.—In 1899 this company showed an increase of only $589,262 in gross revenue. That small gain was in part attributable to an unfavorable corn crop, and also in part to the fact that in its 1898 fiscal year the company reported about the heaviest gross gain of any line, $7,274,000, or 20 per cent. In the fiscal year ending June 30, the company again appears as gaining largely, the amount being $4,145,556, or over 9½ per cent.; but almost this entire increase was absorbed in larger operating expenses. The increase in net earnings was, in fact, only $859,119. These gains were on very large totals, the company operating an average of 4,946 miles of road, which earned last year a total revenue of $47,535,420, or $6,252 a mile. Operating expenses and taxes were 66.1 per cent., against 64.8 per cent. in 1899, leaving net earnings of $16,113,000; adding other income and deducting interest and rentals, there was a balance of $8,416,000, from which were paid sinking fund charges of $487,400 and 6 per cent. dividends on a variable amount of stock, this having been increased during the year from $93,742,000 to $98,447,500. This increase in capital was due in part to the exchange of convertible bonds, but in larger part was on account of the sale to stockholders at par, in April, 1899, of $4,041,500 stock, when the shares were selling at a premium of about 40 points. That issue of stock was made in part to provide funds for improvements and new equipment, and in part for refunding operations. Allowing for bonds cancelled, or bought for sinking fund, and converted into stock, the net increase in funded debt in 1900 was $9,461,400. At the end of the year the outstanding bonds were $135,899,100 for the company proper, but including bonds of controlled roads, the total was $149,297,100 on 7,840 miles, of which 179 miles are narrow-gage lines, on which no bonds are outstanding. In addition 1,584 miles additional of the Burlington lines have no bonded debt.

In the past year the mileage was increased by 242 miles, of which 71 miles was on account of the Chicago, Fort Madison & Des Moines, taken over during the year, and the balance newly constructed lines. Twenty miles were in Iowa and 130 miles in Western Nebraska, the latter extensions or branches of the division into Wyoming. Fifty miles additional in Wyoming and South Dakota are to be credited to construction work in the same district.

Further additions to the operated lines, both from new mileage and acquired road, will be made in the current year. The roads in Iowa and Missouri, now held under lease, the Hannibal and St. Joseph, the Kansas, St. Joseph & Council Bluffs, the Chicago, Burlington & Kansas City, etc., are to be purchased in fee and formally merged. The company now owns practically all their stock and most of their bonds, and they comprise the standard gage line above referred to as without outstanding bonded debt. Other acquisitions include the Kansas City & Omaha Railway, 193 miles of branch road in Central Nebraska, with additional short branches in the Black Hills region, and 131 miles of new line from the present road in Montana to Cody City in Northern Wyoming, which is to be completed next fall.

Operating expenses were charged directly with a heavy amount of improvement work. Maintenance expenditures account for $2,502,000 out of a total increase of $3,261,200 exclusive of taxes. Of this maintenance of way absorbed $1,786,000, and equipment $716,000. Burlington's total maintenance expenditures last year were $1,803 per mile, including equipment. On track work and buildings, expenditures were $1,045 per mile, and for equipment $428 per mile.

The number of tons moved one mile on the standard gage roads increased 12.4 per cent. as compared with 1899; and freight earnings increased 11.2 per cent. Passengers carried one mile increased 4.6 per cent., and passenger earnings increased 5½ per cent. The percentage of operating expenses to gross earnings increased 1.4 per cent.

St. Louis & San Francisco.—In the past fiscal year this company merged with its other lines the Kansas City, Osceola & Southern, 151 miles, and the Kansas Midland, 106 miles, which, with an 18-mile extension of a branch, brought its operated line up to 1,659 miles on June 30 last. The other long lines taken over by the company since 1897 include the Central Division of the old Atlantic & Pacific, 112 miles, and the extension to Oklahoma City, 105 miles, which was new construction. The company is now building from a point on this latter line south into Denison, Texas, 198 miles. This addition will bring its mileage about back to the figure at which it stood at the time of the lease to the Atchison, before its receivership.

The present line is earning more revenue than in any previous year, and the company has paid increasing dividends. Expenses took 58.4 per cent. of the earnings, against 60 per cent. last year, and there was a balance over all charges of $944,500.

There is one rather interesting phase of the financial policy of the company. While in each year it has carried out capital betterments to the full extent of the funds that became available for improvements under the terms of the reorganization, and has drawn the earned bonds from the trustee, none has been issued, but all are held in the treasury, the total being $1,120,625. The only bonds that have been issued cover the construction or acquisition of new lines or additional equipment.

Maintenance expenses seem comparatively small, as compared with figures that have become customary on many lines in the last year or two when increases in gross revenue have been so largely and systematically reinvested in the properties. Maintenance of way cost last year was $621 a mile, against $560 a mile in 1897; but either from good management or better physical condition, or both, transportation is done cheaper year by year. The ton-miles increased in 1900 by 14,616 thousands or 3 per cent., but there was an actual decrease in freight train mileage of 540,000 miles, or 14 per cent. Passenger miles increased 21 per cent. but train miles only 7½ per cent., the result being that in both freight and passenger train mile revenue increased substantially, being aided also by higher ton-mile and passenger mile revenue.

Nashville, Chattanooga & St. Louis.—Interest in the annual report of this company for the fiscal year ended June 30, 1900, is augmented by the statement made five months ago by August Belmont, Chairman of the Louisville & Nashville, which owns a majority of its stock, that dividends to Nashville, Chattanooga & St. Louis stockholders have been paid for many years out of funds which should have been devoted to the maintenance and extension of the property and that additional expenditures would necessitate a suspension of dividends at least five years. The gross earnings this year were $6,487,318, or $6,938 per mile, the largest total and probably the largest per mile earned in the history of the company. The gain over last year was $405,551, or 6⅔ per cent. These earnings were on 935 miles of road, and do not include the Memphis & Paducah Division, whose lease has only just been ratified by the stockholders. There has also been an increase of operating expenses from $4,099,707 in 1899, to $4,240,584 this year, a gain of $140,877, or 3.4 per cent. The result is a gain of $264,675, or 13⅓ per cent., in the net earnings this year.

The gains in earnings this year have been practically all on freight. There was a falling off of 10.8 per cent. in passenger earnings from $1,425,289 in 1899, to $1,271,371 this year. The total passenger train mileage was 1,239,643, against 1,346,176 miles last year. The earnings per passenger train-mile this year were $1.02, against $1.05 a year ago. At the same time the passenger rate per mile was increased from 2.27 to 2.48 cents. The gain in freight receipts was 12.6 per cent., or $537,907, from $4,275,099 in 1899, to $4,813,006 in 1900, and the earnings per freight train-mile increased from $1.51 to $1.67, while the increase in freight train mileage was less than 2 per cent., from 2,836,496 to 2,887,590 miles. The rate per ton per mile was 0.88 cent, against 0.87 cent a year ago.

Under expenses, maintenance of way and equipment were the only general items to show increase. The cost of transportation fell to $2,409,153, or 4.8 per cent. Maintenance of way expenses were $939,450, an increase of $39,052. Maintenance of equipment required an expenditure of $704,075, against $472,418 in 1899, and $359,984 in 1897. This expenditure includes seven new freight engines to replace an equal number too light for service, and 113 new freight cars to take the place of others destroyed. The company also bought 304 box cars for $167,200, which was added to capital account. Repairs during the year include 99 engines thoroughly overhauled, four equipped with electric headlights and 67 with M. C. B. couplers. Air-brakes were placed on 2,216 cars at a cost of $121,880, and automatic couplers on 2,719 cars at $54,380, both the latter being charged

to capital. Including 550 cars of the Memphis & Paducah Division, the total number of freight cars is 6,113, of which 5,416 are equipped with air-brakes and 5,906 with automatic couplers. Improved terminal facilities have been provided for this company and the Louisville & Nashville at Nashville, Tenn., including union passenger station, freight yard, engine house, coal yard, etc. This is under the Louisville & Nashville Terminal Co., and the property is leased jointly to the two companies at a rental of 4 per cent. per annum, proportioned according to the number of cars handled.

Chicago Terminal Transfer.—This road is peculiar in that less than half its income (only $591,818 out of a total of $1,265,961 last year) comes from the operation of its own trains. It affords entrance to Chicago for a number of roads, and in the fiscal year ended June 30, the gross earnings from railroad tenants was $579,859. This was a decrease of $21,468 from the similar receipts of the previous year, due to the withdrawal of the Wisconsin Central from occupancy of the company's terminals after Dec. 10, 1899. The company has increased its earnings from traffic from $529,520 in 1899, to $591,818 this year, a gain of $62,298, or nearly 11.8 per cent. The number of cars handled was 171,244 this year, against 152,997 last year, an increase of 18,247 cars, or 11.9 per cent.

August Accidents.

Our record of train accidents in August, given in this number, includes 88 collisions, 98 derailments and 6 other accidents, a total of 192 accidents, in which 44 persons were killed and 158 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

Collisions:	Rear.	Butting	Crossing and other.	Total.
Trains breaking in two	7	0	0	7
Misplaced switch	3	2	6	11
Failure to give or observe signal	3	0	3	6
Mistake in giving or understanding orders	0	5	0	5
Miscellaneous	6	2	12	20
Unexplained	11	13	15	39
Total	30	22	36	88

Derailments.

Broken rail	1	Careless running	2
Loose or spread rail	2	Track repairers	1
Defective bridge	4	Runaway	2
Defective switch	1	Open draw	1
Broken wheel	4	Animals on track	1
Broken axle	7	Washout	1
Broken truck	2	Malicious obstruction	2
Fallen brakebeam	2	Accidental obstruction	4
Failure of drawbar	3	Unexplained	49
Broken car	1		
Misplaced switch	5		98
Derailing switch	3		

Other Accidents.

Broken side rod	1	
Cars burned while running	2	
Other causes	3	6
Total number of accidents		192

A general classification shows:

	Collisions.	Derailments.	Other accidents.	Total.	P. C.
Defects on road	0	8	0	8	4
Defects of equipment	7	19	1	27	14
Negligence in operating	42	14	2	58	30
Unforeseen obstructions	0	8	3	11	6
Unexplained	39	49	0	88	46
Totals	88	98	6	192	100

The casualties may be divided as follows:

Killed:	Collisions.	Derailments.	Other accidents.	Total.
Employees	21	14	0	35
Passengers	4	1	0	5
Others	2	2	0	4
Totals	27	17	0	44
Injured:				
Employees	55	40	2	97
Passengers	33	18	9	60
Others	1	0	0	1
Totals	89	58	11	158

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	0	2	4	10
Defects of equipment	0	5	1	1
Negligence in operating	4	34	25	63
Unforeseen obstructions and maliciousness	0	6	2	13
Unexplained	1	13	3	10
Totals	5	60	35	97

Twenty-four accidents caused the death of one or more persons each, and 36 caused injury but not death, leaving 132 (61 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with August of the previous five years shows:

	1900.	1899.	1898.	1897.	1896.	1895.
Collisions	88	89	83	64	48	53
Derailments	98	100	94	61	54	71
Other accidents	6	4	5	3	2	8
Total accidents	192	193	182	128	104	132
Employees killed	35	30	26	17	39	30
Others killed	9	9	17	15	18	19
Employees injured	97	95	93	55	53	41
Others injured	61	59	158	85	87	99
Average per day:						
Accidents	6.19	6.23	5.77	4.13	3.36	4.26
Killed	1.42	1.26	1.39	1.03	1.52	1.58
Injured	5.10	4.97	8.10	4.52	4.52	4.52
Average per accident:						
Killed	0.23	0.20	0.24	0.25	0.45	0.37
Injured	0.82	0.80	1.38	1.10	1.34	1.06

The most disastrous accident in the present record was the collision at Pierson, Mich., on the 15th, where nine persons were killed or fatally injured. In the wreck at Lake Charles, La., on the 12th, the cars were very badly broken up, and the fact that only one person was killed is remarkable. Another derailment remarkable for freedom from fatal results was that near Sandusky, Ohio, on the 17th. The derailment at Delray, Mich., on the 31st, which, fortunately, resulted in no personal injuries, affords a good illustration of the value of a derailing switch. The present record contains four cases of bridge failures. One of these cases was investigated by the Illinois Railroad Commissioners, but they have not as yet made a report on it.

The rear collision at Kensico, N. Y., on the 21st, was investigated by the county coroner, and the conductor and rear brakeman of the foremost train were held for trial on a charge of manslaughter in the second degree. It appears that at Kensico there is a semaphore signal some distance north of the station which is designed to be used in lieu of a flag (or in addition to it) when a train is standing at the station. It is said that this semaphore was not put in the stop position, but the standing train was a long one and it does not appear that the semaphore would have protected it. A similar collision was reported from Newmarket, Ont., on the 10th. This was on the Grand Trunk road, which has semaphore signals of this kind at many stations. The accident occurred in daylight, but there was a curve in the line and the "semaphore was not raised." Failure to use a safety appliance which is near at hand is not a new difficulty in railroad work; and the moral in these cases is the same as that of similar cases 20 years ago: Make your signaling complete as far as you go. If a semaphore is to protect a switch have it interlocked with the switch lever; then it cannot be left in the all-clear position unless the switch is right. If it is to protect standing trains and is not controlled by the attendants of two regular block-signal stations, the automatic control of a rail circuit is the only adequate safeguard.

The newspapers of Aug. 28 reported two cases of brakemen being killed by trains which they were sent out to flag, one near Dresden, N. Y., and the other at Alford, Pa. At the latter place the flagman displayed his flag and saw that it was seen by the approaching engineman, and then he sat down on the track to rest for a moment. It is supposed that he fell asleep at once. The approaching engineman saw him plainly, and expecting that he would get up in time to avoid being struck did not slacken speed until it was too late. Near Matawan, N. J., on the 17th, a passenger train ran several miles without control, the engineman having fallen out of the cab. The fireman, at work at the fire-box, far back of the cab, was ignorant of the accident until he noticed the excessive speed.

In a butting collision on the Toronto, Hamilton & Buffalo near Brantford, Ont., on the 4th, several employees were killed. On the 10th, near Norton, N. B., a passenger train broke through a trestle bridge and the engine, several freight cars, a baggage car and a passenger car fell with the wrecked bridge, about 70 ft. The engineman was killed and every person on the train was injured. On the 4th, near Guanajato, Mex., on the Mexican Central, a passenger train broke through a bridge and six passengers were killed.

Fourteen street car accidents were reported in the newspapers in August, one of them being a butting collision of freight cars. One person was killed and 46 were injured in these accidents.

At Berlinsville, near Slatington, Pa., on the 12th, a coach filled with men and women returning from a funeral was truck by a locomotive of the Lehigh & New England, on a crossing, and 13 persons were killed. It is said that trains rarely run over this part of the road on Sunday, and this fact is supposed to account for the incautiousness of the driver of the coach.

The International Railway Congress has accepted the invitation of the American Railway Association to meet in America; and the next World's Railroad Congress will, therefore, be held in Washington in October, 1904. This fact is given in a cablegram from Secretary W. F. Allen, who is now in Paris. It will be remembered that the invitation which is now accepted was the result of a unanimous vote of the Association, taken by letter ballot before the meeting of last April. The number of American representatives present at the session of the Congress which has just closed, was 14, as follows: L. F. Loree, General Manager Pennsylvania lines west of Pittsburgh, and President American Railway Association; J. Ramsey, Jr., Vice-President and General Manager Wabash; J. T. Harahan, Second Vice-President Illinois Central; C. W. Buchholz, Chief Engineer Erie; S. T. Crapo, General Manager Flint & Pere Marquette; C. L. Bretz, General Manager West Virginia Central & Pittsburgh; Paul Didier, Assistant Chief Engineer Pittsburgh & Western; C. P. Clark, Director New York, New Haven & Hartford; P. H. Dudley, Inspecting Engineer New York Central; Dr. C. B. Dudley, Chemist Pennsylvania; A. W. Gibbs, Assistant Mechanical Engineer Pennsylvania; James L. Taylor, Pennsylvania; M. A. Knapp, Chairman of the Interstate Commerce Commission, and W. F. Allen, Secretary of the American Railway Association. The presence of Mr. Knapp at Paris as the delegate of our Government was an incident showing how the United States is enlarging its relations with the other nations of the world. Indeed, the invitation to the Congress to meet in this country has, we believe, the practical indorsement if not the formal signature of the Secretary of State. In view of the customs in the countries where the Congress has met heretofore, and of the large number of State railroad administrations participating, it will be almost a necessity to give the Washington meeting something of the character of a Government function.

The Railroad Commissioners of Massachusetts have made a report on a fatal collision of street cars which occurred at Webster on the Fourth of July. The Commissioners make a number of pointed criticisms on the management of the line. The Worcester & Webster Company ran cars over the track of the Webster & Dudley Company without legal right, having had no permission from the Commissioners; and, more than this, ran an extra car without notifying the owning company and without issuing any special time-table or notice. It appears that little or no effort was made to make the necessary arrangements to permit the running of cars on this holiday by the two companies without interfering with one another, and this is characterized in the report as little short of reckless management.

NEW PUBLICATIONS.

Horseless Vehicles, Automobiles, Motor Cycles, Operated by Steam, Hydro-Carbon, Electric and Pneumatic Motors. By Gardner D. Hiscox, M.E. Octavo, 460 pages, 316 illustrations. New York: Norman W. Henley & Co., 1900.

The public needs a concise presentation of the matter bearing on the automobile question, which is of interest to the business man, the investor, the engineer, the mechanic, and the pleasure seeker. Mr. Hiscox and his publishers have produced a book which, being the first in the field, will fairly satisfy this demand, but it might have been a good deal better done. Although the ground has been pretty thoroughly covered, yet the matter has not been systematically arranged, and the reader's mind at times wearies from the diffuseness of the detail. It is evident that the author is an industrious compiler, and he is indebted to trade catalogues for cuts and descriptive matter. There is no uniformity in the style of the illustrations, and many of them are on too small a scale to give a satisfactory idea of details; the illustrations of the Petter carriage gear (on p. 221) show a plan view which may be termed right-handed, and a sectional elevation (of the motor) which is left-handed relatively to it.

Indeed, the book is essentially a collection of descriptions, more or less elaborate, of machines and their parts, and as such it will be found of great convenience to those who wish to inform themselves as to any one contrivance, or as to the state of the art. But it would have been more useful if the information had been better digested and better indexed. The last sub-heading of Chap. XII. is "The General Power Co. Automobile Motor," and under this heading there are some three pages of valuable information on the relative dynamic value of equivalent weights of different fuels, which shows the superior value and the safety of kerosene, and yet this important matter is nowhere referred to in the index. The typography is excellent, and the press work very clean; but if the signs of the times are not misleading, an exacting public will say that the contents of this book might easily have been reduced to a much smaller volume; there is liberal physical padding, to say nothing of the intellectual. The title page says this is a "practical treatise," but the first impression received from its weight, size, and cost, is that it is an "edition de luxe."

It is interesting to learn that there are about 100 makers of automobiles in this country, that America is gaining ground more rapidly than foreign countries which preceded them in attacking the automobile problem, and that the certain increased demand for automobiles is going to bring along with it a general and widespread public sentiment in favor of better roads.

Gas Engine Construction. By H. A. V. Parsell, Jr., and Arthur J. Weed, M. E. 8-vo., 296 pp., 140 illustrations. New York: N. W. Henley & Co.

The chief fault to be found with this work lies in its title. One would naturally expect from the heading "Gas Engine Construction" a broad treatise on the detailed designs and the methods of construction in vogue throughout the world of gas engine manufacturers. Instead, one finds a narrative description of how one particular engine was built, even to the minutiæ of the chucking and tooling of each particular piece, and of a 2½ in. x 4 in. model engine at that.

This fact once understood the book deserves certain praise. The narrative is so completed and so well reinforced by photographic and working-drawing illustrations that no boy of 16 at all familiar with the inside of a machine shop could easily fail to follow the directions given. The work covers the complete construction, including pattern making, finishing and erecting, but not the casting, of the engine with the exception of bed-plate and flywheels, with reliance upon no other tools than an 8-in. lathe having no lead-screw. There is probably no better book to be put into the hands of a youth ambitious to build a gas engine.

The portion of the book devoted to explanation of general principles and to rules for design had been better omitted. The explanation of theory is too short and faulty to be of any use to either those who know nothing of the subject or to those who wish to know more. The explanation on p. 24 of the value of compression is about as erroneous and misleading as it well could be. The rules given for the calculation of power, speed, flywheel weight,

etc., given on pp. 263 et seq., are absolutely uninstructive and almost unintelligible; that for the flywheels is annulled by a mistake in placing the decimal point which runs through to the end. The annotated bibliography at the close of the volume is also at fault, the notes appraising the various authors almost exactly in inverse ratio with their true worth.

The make-up of the book is of the best. The paper is heavy, the margins generous and the typography clear. The illustrations are either half-tone reproductions of photographs of actual work or line-cuts of working-drawings.

Railway Signaling. By H. Raynar Wilson. London: Published by *The Railway Engineer*, 8 Catherine street, Strand. Price 18 shillings.

This is an elaborate work of 160 pages, 10 in. x 12 in., printed on plate paper. The substance of the work, which is confined principally to interlocking and the staff and tablet systems, is made up of articles which have appeared in *The Railway Engineer*. Mr. Wilson is Signal Superintendent of the Lancashire & Yorkshire Railway and his opinions are based on long experience. Each subject is treated in great detail and there are many full page drawings. There are a number of half-tone engravings, from photographs, of large yards, and large folded sheets showing the plans of signaling at Waterloo, Waverley (Edinburgh), Liverpool street (Great Eastern), and Newcastle-on-Tyne (Northeastern). Smaller plans are shown of a number of other large plants. At the east end of Waverley station the cabin has a single locking frame of 260 levers, of which only 14 are spare. This is spoken of as the largest apparatus in the world. The interlocking machines described in this work are those of Saxby & Farmer, Stevens & Sons, Dutton, the London & Northwestern Railway, McKenzie & Holland, Tweedy, Evans & O'Donnell, and the Great Western Railway. Considerable space is devoted to cabins, with detailed plans and elevations of the styles used on different railroads.

The author intends, in a second book, to take up the subjects of "lock and block," automatic signaling, electrical apparatus and electro-pneumatic signaling. In the present volume he has endeavored to confine himself to standard appliances which have proved satisfactory on British railroads. An appendix gives the standard specifications of the Great Eastern Railway for signaling work; and the requirements of the Board of Trade are also quoted.

Supplement to the Directory to the Iron & Steel Works of the United States. Second edition, corrected to Aug. 15, 1900. Philadelphia: American Iron & Steel Association, No. 261 South Fourth street. 1900. $2.

Mr. James M. Swank, General Manager of the American Iron & Steel Association, has issued a second edition of the Supplement to the Iron & Steel Directory. This supplement is a descriptive list of the consolidations of iron and steel companies which have taken place since Jan. 1, 1898. The companies here described number 30, the list being confined to those which embrace the ownership of blast furnaces, rolling mills, steel works, tin plate works, shipbuilding and bridge building works and allied industries. Only such companies as have been consolidated since Jan. 1, 1898, are described, earlier consolidations appearing in the Directory. A few of the companies which appear in the Supplement are the American Bridge Company, the American Car & Foundry Co., the American Steel & Wire Co., the Federal Steel Co., the National Tube Co., the Pressed Steel Car Co., the Shelby Steel Tube Co., and the Southern Car & Foundry Co.

The Victoria Jubilee Bridge.—We have received from the Passenger Traffic Manager of the Grand Trunk Railway a souvenir of the Victoria Jubilee Bridge, which was opened for traffic Dec. 13, 1898. This souvenir is a small 12-mo. volume containing a short account of the famous Victoria tubular bridge built by Robert Stephenson and Alex. M. Ross, Engineers, and Messrs. Peto, Brassey & Betts, contractors. It contains also a number of half-tone engravings of the old bridge, of medals issued at the time, of portraits, etc. A short description of the new "Jubilee" bridge, which replaces the old tubular bridge and rests on the same piers, is then given. Mr. Joseph Hobson, Chief Engineer of the Grand Trunk, is Chief Engineer of the bridge, and it was built by the Detroit Bridge & Iron Works and the Dominion Bridge Co. The souvenir is remarkable as being enclosed in aluminum covers, which have no merit that we can discover, except that of novelty.

TRADE CATALOGUES.

The Niles Tool Works, of New York and Hamilton, send to us a beautiful book designed for distribution at the Paris Exhibition and perhaps this catalogue counted for 1 or 2 per cent. in the sum of the influences which resulted in the Niles Tool Works getting the grand prize, the highest award at the exhibition. The catalogue is in English, German and French, and printed in three colors, with numerous beautifully executed, half-tone engravings. The scheme is to put on one page a picture of a machine tool, and, on the facing page, a description of it in the three languages. We have often thought that one result of the free use of the printing press in preparing for this latest World's Fair will be to enlarge the French and German vocabulary of a great many Americans. For instance, all of our readers will be glad to know, and stow away for future use, the fact that a pulley boring machine is in German Riemscheibenbohrmaschine.

Steel Hopper Cars.—The American Car & Foundry Co., 71 Broadway, New York city, send to us a pamphlet on Structural Steel Hopper Cars, which pamphlet can be procured from the main office of the company or from the Steel Car Department Office, Union Trust Building, Detroit. The pamphlet contains a short review of the development of the all-steel car, and cars built for the Solvay Process Co., the Lake Shore & Michigan Southern and the Delaware, Lackawanna & Western are illustrated and somewhat thoroughly described. There are tables giving comparative data of weights and capacities of steel hopper cars, as made by the Carnegie Company, the Pressed Steel Car Co., the American Car & Foundry Co., the Keystone Bridge Works and others. The cars illustrated in this pamphlet are built for a carrying capacity of 110,000 lbs. of ore, limestone, or average coal.

The American Brake Company, St. Louis, Mo., has issued a new catalogue of locomotive driver and truck brakes. A large number of designs are illustrated in detail as generally applicable to the majority of standard locomotives, but special designs are furnished when required. The catalogue also includes an automatic slack adjuster now being used largely on passenger and freight equipment. Special attention is called to the simpler arrangement of the brake gear which can be got if the frames of new engines are made to take directly the fulcrum and suspension points; this gets rid of a large number of pieces bolted to the frames and is a point worth noting in designing new locomotives. The catalogue shows clearly what changes in the frame construction are required.

Aging of Transformer Iron.—The General Electric Company is distributing a 92-page pamphlet on the subject of "Aging of Transformer Iron," containing five articles, the titles of which are as follows: "The Aging of Transformer Iron," by Prof. W. Elwell Goldsborough; "On Slow Changes in the Magnetic Permeability of Iron," by W. M. Mordey; "Effects of Prolonged Heating on the Magnetic Properties of Iron," by Mr. S. R. Roget, B.A.; "Hysteresis in Sheet Iron and Steel," by Mr. Arthur Hillyer Ford; and "The Aging of Transformer Steel," by J. A. Capp. This pamphlet contains valuable information for central station managers, and will be furnished free of charge upon application to the General Electric Company.

Machine Tools.—The Newton Machine Tool Works, Vine and Twenty-fourth streets, Philadelphia, Pa., send to us catalogue No. 34, being an octavo volume of 192 pages, with index, bound in cloth. No space is wasted in description of the works or other introduction, but the volume opens at once with a picture of a perforated milling cutter for internal lubrication, and this is immediately followed by a picture and brief description of a No. 1 plain milling machine. This house makes pretty nearly everything in the way of standard machine tools and each page of this catalogue shows a different tool accompanied by a short description.

The Drexel Railway Supply Co., Chicago, has issued a pamphlet illustrating the "Gibraltar" bumping post. This consists of a heavy casting with a striking plate attached to central diagonal braces made of two rails. At the lower end and at the rear, this brace is fastened to the track rails which are curved in toward the center at that point. A long piece of rail is placed bottom-side-up beneath the ties at the center of the track and this rail is connected to the bumping block by vertical tie rods. There are also diagonal rods from the bumping block which extend forward and are attached to the track rails.

The Edwards Window Fixtures.

Among railroad specialties meeting with success are the Edwards window fixtures. Some recent improvements and additions to this line of fixtures are deserving of special mention, among which we call attention to the improved adjustable roller sash balance, with the worm gear attachment in the roller brackets. By means of this attachment the sash balance can be adjusted to any desired tension without removing the roller from the brackets or disturbing any of the parts or finish.

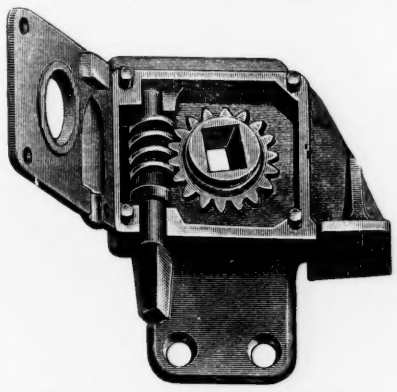

Fig. 2.—Edwards Window Fixture.

Fig. 1 shows the manner in which the linen mat "A" is fastened to the top rail of the window. The lower end of the mat is placed around the brass strip "D" which is held in place by the two small brackets "H." The upper end of the mat is secured to the roller "B," the ends of which engage with the brackets "F" and "F," and the whole device is then supported by the wooden framework "E," which is screwed fast to the window posts. The bracket "F" contains the adjusting arrangement as shown by Fig. 2. The desired tension can be given the operating spring by manipulating the screw "C," Fig. 1. There is a piece of rubber, "G," placed in the top of each of the side rails of the window, to cushion the window when it has reached the extreme upward travel. There are two metal friction strips which press against the side rails of the window, holding it firm against the outside window stop, making a tight sash. These two friction strips

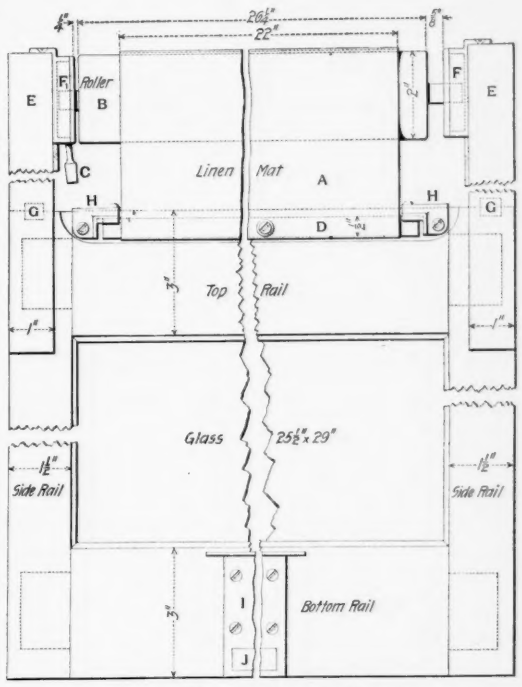

Fig. 1.—Edwards Window Fixture.

are operated by a double thumb catch on the window sill, which, when pressed together, permits the sash to rise. This double thumb catch has combined with it a lock barrel, which, when the window is entirely closed, enters the keeper "J" and prevents the window from working up.

A large number of passenger coaches on the Pennsylvania Railroad Company's lines are equipped with these window fixtures. They are satisfactory and have reduced very materially the amount of broken window glass. Passengers seem to like these windows, especially on the short-run seashore trains, as they can adjust the height of the window to suit their fancy.

Combination and Steel Bridges.

We have from Mr. H. G. Tyrrell, of the Boston Bridge Works, the following estimate of the comparative cost of combination and all-steel highway bridges. The bridge in question was designed for the Pacific coast. The dimensions are as follows:

Span	190 feet.
Roads	24 feet.
Two walks, each 6 feet wide.	
Total width	41 feet.
Depth of truss, 27 feet to 33 feet.	
Wood joist.	
Floor, 4-inch wood block paving on 3-inch plank.	
Uniform live load on floor—100 pounds per sq. ft.	
Concentrated live load on floor—15-ton roller, or two electric cars on each track.	
Live load per foot of bridge—3,300 pounds.	
Dead load per foot of bridge—2,345 pounds.	
Trusses pin connected.	

For the combination design hard pine was used for top chords, web posts, portals, lateral struts, floor-beams and joist. Remaining parts were of steel.

The estimated quantities for this case were:

Eye bars	42,180	pounds.
Cast-iron joint blocks	19,720	"
Lateral rods	5,810	"
Machine work	5,200	"
Shoe plates	5,940	"
Loops	3,160	"
Hangers	1,240	"
	83,250	pounds. Cost $3,130
Hard pine chords and posts	17.50	M.
" " lateral struts	3.08	"
Floor plank	19.74	"
" joist	22.24	"
" beams	14.80	"
	77.36	M. Cost $2,400
Paving 504 square yards		750
Fence 400 feet		200
Erection		1,200
Total cost of combination span		$7,680

This cost is about $1 per sq. ft. of total floor. For the all-steel design the quantities were:

Steel	180,000	pounds cost $7,360
Floor plank	$19.74	M. 1,345
Wood joist	22.24	
Fence 400 feet		200
Paving 54 square yards		750
Erection		1,200
Total cost of steel span		$10,945

This cost is $1.43 per sq. ft. of total floor. The above comparison applies to whole superstructures complete. Compare now the cost of substituted parts only. In

combination design, the top chords, web posts, portals, lateral struts and floor beams contain:

Hard pine, 35.3 M. at $35 per M.	$1,220
Cast-iron joint blocks, 19,700 pounds at 3c.	591
	$1,811

For the all-steel design, the same parts contain:

Steel, 118,200 pounds, at 4c.	$4,720

Summarizing we have:

Combination bridge cost	$7,680
Steel bridge cost	10,945
Combination chords, etc.	1,811
Steel chords, etc.	4,720

Hence, we may say, roughly, that the combination bridge cost one-third less than the steel one. Also, that the comparative cost of wood (including necessary cast blocks) and steel for top chords, web posts, portals, lateral struts and floor beams, is as one to three.

TECHNICAL.

Manufacturing and Business.

H. W. Johns Manufacturing Co., 100 William street, New York city, recently secured a contract from the Pittsburgh Plate Glass Co., Ford City, Pa., for furnishing and applying Asbestos Fire Felt Covering for factory No. 3, in which plant twelve new boilers and the necessary steam pipes are now being installed. The contract in question will amount to over $2,000.

The reduction in price of rails has brought many cable a contract for supplying and applying its asbestos fire felt covering for the steam pipes, boilers and brine pipes at the Havana Brewery, Havana, Cuba. The company is sending skilled labor from New York to do the work. A number of new plants are being built in Havana, and the H. W. Johns Mfg. Co. believes that by keeping skilled labor, and materials at that point it will be enabled to secure the work of applying its materials to these new plants.

Iron and Steel.

The reduction in price of rails has brought many cable inquiries from foreign countries, and mill agents are now negotiating for several large lots.

The old Paterson Iron Works are reported sold to Charles E. Beckwith, George D. Beckwith and James D. Shields. A new company will be organized.

Stephen G. Williams has been appointed Receiver for the Engineering Contract Co., of 71 Broadway, New York. This company was incorporated in 1898, to take over the business of Sooysmith & Co., to build bridges, foundations and to do general contract work. Charles H. Deans recently resigned as President on account of ill health. Edwin S. Jarrett is Vice-President.

The following changes were announced Oct. 1 by the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.: J. M. Lewis, assistant to the President; John W. McQueen, Secretary and Treasurer, in charge of the sales department; Priestly Toulmin, General Manager in charge of furnaces, coal mines, coke ovens, engineering, etc.; A. G. Palmer, General Agent in connection with the traffic and sales departments; Charles H. Schoolar, Auditor; Henry Hiden, Purchasing Agent. Second Vice-President T. H. Aldrich, in charge of the coal department, has resigned; J. H. McCune, in charge of the furnaces, has resigned; John H. Means has succeeded Mr. McCune; Gentry Hillman has been placed in charge of the furnaces at Sheffield and Florence.

M. C. B. Brake Shoe Tests.

The Master Car Builders' Association Standing Committee on Brake Shoe Tests has sent out the following circular: "Referring to the circular of this committee, issued July 18, 1900, in which it was stated that tests of brake shoes would be made during the month of March, 1901, it has been deemed advisable to modify this notice to the extent that no tests will be made after March 1, 1901, and if any of the railroads represented in the Association wish to have brake shoes tested, they should at once put themselves in communication with the Chairman of the Committee, in order that proper arrangements can be made for conducting the tests at an early date. Address S. P. Bush, Superintendent of Motive Power, C. M. & St. P. Ry., West Milwaukee, Wis."

M. C. B. Standards.

As a result of the letter ballot which closed Aug. 25, some changes and additions have been made in the Standards and Recommended Practice of the Association, and pamphlets containing these revised Standards and Recommended Practice are now ready for delivery and will be sold at 25 cents per copy, postage added when sent by mail. Lithographs of the illustrations of the Standards and Recommended Practice will be ready for delivery about Oct. 1. These lithographs are 30 x 38 in., printed on transparent paper from which blue prints can be taken. Changes have been made in sheets M. C. B. 7, 9, 14, D and K. Two new sheets have been added, Nos. 16 and 17, showing journal box, bearing, wedge and lid for 5½ x 10 journals and journal bearing, and wedge gages for 5 x 9 and 5½ x 10 journals. A full set of illustrations of the Standards and Recommended Practice consists of 28 lithographs, and these are sold at 25 cents per sheet. The rules for Loading Long Materials were modified as a result of letter ballot, and these rules in pamphlet form are now ready for delivery.

Making the First T Rail in America.

Christopher Lewis, writing, recently, to *The Iron Age*, gives the following retrospect of the rolling of the first iron T rail in America: "As it is a matter of record, no one can dispute the fact that the first T rail ever made in this country was made in Danville, Pa., and as I played a very humble part in helping to make that rail, I trust you will permit me to put on record also those who were actively concerned in making the first rail. The iron was puddled by Joseph Bickley, who was afterward the puddle boss, and Wm. Booth. It was hammered (there were no squeezers then) by Thomas Bucknall, aided by John Kearman. The iron was rolled by James Lee; catcher, John Lee; hooker, C. Lewis. Wm. Hancock, who, in after years in partnership with John Foley, became the proprietors of Rough and Ready Iron Works, Danville, Pa., was the stocktaker; he sheared and piled the iron up that was rolled into the rails. John Stanton and Stephen Love heated the pile and dragged it to the rolls (there were no buggies then). Wm. Evans and Thomas Harris, roughers; Thomas Lee, catcher. James Lee, John Lee, Wm. Jones and Wm. Twist were hookers on the catcher's side. Wm. Harris, who designed the mill, built it and superintended it, rolled the rail. Hookers on the rollers' side were Joseph Hughes, M. S. Ridgeway and Wm. Evans. I am fully convinced the names of those who made the first rail—T, I mean—ever made in this country have never been recorded." The foregoing paragraph conjures up a very real picture of the old rolling mill, and of the faces of some of the men named. The writer of this had there his first real work, and got there his first measure of the iron workers of America.

Air-Brakes—Nashville, Chattanooga & St. Louis Ry.

The following is from the report of the condition of air-brakes on cars entering and leaving Nashville yard during the month of August. These statements are compiled monthly by Mr. J. W. Thomas, Jr., General Manager of the Nashville, Chattanooga & St. Louis. Of the cars entering Nashville yard during August, 121 had the brakes cut out, of which 88 were Westinghouse brakes, 21 New York, 4 Landsberger, 4 Boyden and 4 Crane brakes. The reasons for cutting out the Westinghouse and New York brake are given below. Three Landsberger, 2 Boyden and 3 Crane brakes were cut out on account of blowing at the exhaust port; 1 Landsberger and 1 Boyden because of check valve case gasket blown out, and 1 Boyden and 1 Crane because the triples needed cleaning. From the following it will be noted that the number of cars cut out because of Westinghouse triple valve defects was 0.4 per cent. of the number of Westinghouse cars handled and the New York triple valve defects were a little more than 1 per cent. of the cars fitted with that brake.

	Westinghouse.	New York.
Blowing at exhaust port	30	9
Release valve leaking	12	1
Branch pipe broken	3	3
Check valve case gasket blown out	2	1
Brake rigging in bad condition	8	..
Triple valve need cleaning	14	4
Cylinder gasket blown out	1	..
Triple valve gasket in bad condition	1	..
Slide valve leaking	1	..
Packing leather in brake cylinder worn out	2	..
Train pipe bursted	1	1
Sand hole in auxiliary reservoir	1	..
Flat wheels	2	..
Train pipe broken	1	..
Works emergency in service application	3	..
Emergency valve sticking	1	..
Nothing wrong	5	..
Blowing at vent port	..	2

The number of air-brake cars forwarded from Nashville was 9,240, of which 73 had the brakes cut out, and there was an average of 16.3 serviceable air-brake cars per train. Of the 73 cars cut out, 36 belonged to railroads and 37 to private car lines. The division of air-brake cars, according to brake makers, is as follows: Westinghouse, 8,229; New York, 988; Landsberger, 11; Boyden, 6 and Crane, 6. The following is a list giving the reasons why the 73 brakes were not working:

Blowing at Exhaust—	
Westinghouse	9
New York	13
Landsberger	9
Boyden	4
Crane	4
Blowing at vent ports—New York	2
Check valve case gasket blown out—Westinghouse	1
Triple valve gasket worn out	2
Release valves leaking	7
Sand hole in triple valve body	2
Auxiliary reservoir bursted	2
Sand hole in auxillary reservoir	2
Brake cylinder piston broken	2
Brake rigging out of order	11
Branch pipe broken	3

The Schenectady Locomotive Works.

The Schenectady Locomotive Works have partially completed a substantial central power station, built of brick, and to contain electric generating machinery, air compressors and other power, sufficient to operate the works in general, particular attention having been given to electric driving of individual shop tools and groups of machines. We shall later show plans of this building, and the apportionment of its space to various factors of power to be placed in it. The works are now turning out locomotives, some of which are of the very heavy types of to-day, at the rate of 37 locomotives in 26 working days.

Compressed Air Cars in New York

The following letter is from a gentleman who was for a good many years Chief Engineer of two elevated railroad companies and who is consequently pretty well qualified to speak for city traction matters:

"Last Saturday afternoon, September 22, I happened to be on 23d street and noticed one of the cars passing, run by compressed air power. I watched its operation with others most of the afternoon. They move along splendidly, and with much less noise than those run by electricity, especially as they pass the rail joints. When rounding a curve you can scarcely hear them; no jerk when power was shut off. They stop in a much shorter length of track than the electric cars. When the trolley cars are going under full headway they are noisy. The air cars under full headway make little noise. They leave no electric current in the ground to mother the water pipes. The mechanical improvements which have been made since they ran on 125th street are great. I was impressed very much with the ease they moved along, and the apparently perfect control they were under by the motor man.

"More progress no doubt will be made in mechanical improvements in order to perfect their operation. It is clear to most any good mechanic that the system will in course of a short time be used quite generally on surface street roads."

Tie Plates.

In the last annual report of the Northern Pacific we find this statement: "About two years ago we began using tie plates under heavy rails. This has been continued this year and to June 30, 1900, about 2,654,000 were in track."

The Demerbe Rail for Street Railroads.

Since the year 1894 the Bradford (Eng.) Corporation has been operating 4½ miles of its street railroads with the Demerbe rail, comparing it with a section upon which ordinary girder rails are used. The city's deputy engineer has now reported upon the system that it is all that could be desired and 10½ miles of additional line are to be so laid. It consists of a hollow trough rail, and the fishplate is placed inside under the ends of the rails and exactly fits their contour, the point of application being immediately under the head of the rail. The rail when laid in position is completely filled, by means of specially designed tools, with concrete composed of 4 parts of ½-in. unscreened granite shingle to 1 part of Portland cement. The tie bars used are flat, and the use of screw ends, nuts and bolts is avoided. The rail is inserted into two oblique grooves, one of which is cut so as to exactly fit the outer side of the rail, whilst the other is wider so as to facilitate the introduction of the inner side of the rail. In the space which is left, a wedge of soft steel a little smaller than the opening it has to fit, is inserted and driven up. This arrangement of the tie bar enables the rail to be fixed to gage with almost mathematical exactitude.

Couplers on the Atchison.

The Interstate Commerce Commission has received the following report regarding safety appliances on the Atchison System, at Chicago: "An inspection of some 200 A., T. & S. F. cars in this yard failed to disclose a single defective coupler. Of the fifty or more cars of other owners in the yard, five were found with defective couplers, but the car repairers were after these. One car came to yard in bad order and was to go to shop for heavy repairs, but arrangements had been made to put in new knuckle to avoid using link and pin on way to shop. The Santa Fe has profited by the last report of Inspector Watson. Since Aug. 14 they have had a special inspector to look after couplers. They call him "the Interstate Commerce man." He inspects rigidly against connecting lines who are paying heavy bills for repairs to couplers. This is the most gratifying condition yet found." The reader may be interested enough in this subject to look again at the editorial in the *Railroad Gazette*, Aug. 3, p. 526.

Middle Bearings for Driving Axles.

On the New York, Ontario & Western three locomotives are now running with driving axles having middle bearings. This is an arrangement which Mr. West has had in mind for several years and during the summer of 1899 an engine so fitted was run on heavy passenger trains. In the winter following the device was applied to two other engines and it has worked successfully during the last summer. It is believed that this arrangement will prevent many hot driving boxes. The engines so fitted are heavy moguls.

Locomotives in Russia.

Of the 9,964 locomotives on the Russian railroads at the beginning of 1898 4,157 were equipped for burning coal, 3,408 for burning petroleum, and 2,399 burned wood. As late as 1895 53 locomotives burned peat; but none did so in 1897.

Pneumatic Tools in Europe.

The use of pneumatic tools in Europe has increased marvelously the last year, the monthly average of one concern in this line reaching an average total of 300 shipments a month; or 10 a day. The exhibits of pneumatic tools at the Paris Exposition attracted more attention than any other special line, the appliances having been adapted to so varied a line of work as to be entirely novel, ranging from heavy drilling in armor plate, to the lightest carving in stone, or boring and sawing wood. The hammers range in power from the minimum. Two gold medals were awarded to one company (Chicago Pneumatic Tool Co.). Foreign builders realize that they must use these tools to compete in the markets of the world. One foreign corporation, with a capital of over half a million, has been marketing these tools for the past two years with great success, and another company has recently been promoted in England for the same purpose.

Interlocking.

An interlocking plant has been put in at Arion, Iowa, by the three roads which intersect at that point, the Chicago, Milwaukee & St. Paul, the Chicago & Northwestern and the Illinois Central. The machine is one of the largest in the State, having 64 levers.

New York Rapid Transit.

The route and plans of construction for a rapid transit tunnel to Brooklyn reported by Mr. Parsons were adopt-

ed by the Rapid Transit Board last week. The plan is to extend the Broadway tunnel to Bowling Green and under Whitehall street to the East River. Crossing under the river, the tunnel will reach the Brooklyn shore at the foot of Joralemon street between Furman street and the shore line, run under Joralemon street to City Hall, where there will be a station; then under Fulton street to Flatbush and Atlantic avenues, where for the present will be the terminus. The river part of the tunnel with its approaches, from Bowling Green on the New York side to near the City Hall in Brooklyn will consist of two cast-iron tubes of 15-ft. inside diameter. Two loops will be built at the Brooklyn City Hall, one below the other. One of these will be used for New York trains. The other will be constructed with a view to the future when the extension of the tunnel further into Brooklyn will necessitate running local trains within that borough. The plans also provide for an additional loop on the New York side, beginning under Broadway, somewhere near Exchange place, and running under Bowling Green, State street, Battery Park and Whitehall street back to Broadway. Different grades will be provided for trains turning into this loop and the through Brooklyn trains.

Westinghouse Air-Brake Company.

At the annual meeting of the Westinghouse Air-Brake Co., held in Pittsburgh, Oct. 2, Henry W. Oliver was elected a director, succeeding the late A. M. Byers.

THE SCRAP HEAP.

Notes.

The increase of freight traffic incident to the fall season appears to have begun everywhere. Scarcity of freight cars is reported by railroad officers in the East, in the Central States and in Illinois.

The Massachusetts State Railroad Commissioners have appointed a fourth railroad inspector, Mr. L. H. McLain, of Newton, heretofore Superintendent of a street railroad. Mr. McLain will devote his attention chiefly to street railroads.

At Dubland, Mex., last week a band of five robbers, who were on the trail of a cattle dealer supposed to have $10,000 in money, went through a passenger train while it stood at the station. Not finding their intended victim, they mounted their horses and rode off.

The suit against the Southern Railway in North Carolina for violating the state law in issuing free passes was tried a second time at Morganton last week, and resulted in a verdict of guilty, and two fines of $1,000 each. The penalty is smaller than was imposed on the first trial.

On the Philadelphia, Wilmington & Baltimore, near Chester, Pa., last Sunday a Pullman car conductor on an express train was shot, probably fatally, by the porter of the car. But few passengers were in the car at the time. At Moundsville, Ala., on Tuesday the station agent and the section master fought one another with pistols, and both were fatally wounded.

Traffic Notes.

The Chesapeake & Ohio is said to have secured full control of the Coastwise Steamship Co., owning 20 large vessels, which does a large business in carrying coal to New England.

Two ticket scalpers of Atlantic City, prosecuted by the Pennsylvania road, have pleaded guilty on two out of four indictments, and have been sentenced to imprisonment for two months.

The Pennsylvania Railroad is said to have carried 633,000 passengers between Philadelphia and Atlantic City the past summer, an increase of nearly 11 per cent. over the traffic of last year.

The Northern Pacific has made a contract to haul 6,500,000 feet of logs from Brainerd, Minn., to Minneapolis, 138 miles. Logs from this district have heretofore been floated to Minneapolis.

Mr. B. H. Helm has resigned the commissionership of the New Orleans Freight Bureau. In his last report Mr. Helm says that the things accomplished by the bureau during the past year have been more numerous and permanent than ever before. During the year he has handled 108 claims against railroads, of which 72 have been paid. Mr. Helm gives a long list of subjects on which the merchants of the city still need the assistance of the bureau, most of these being cases where a certain city, a long distance off, gets freight more favorably from the North than from New Orleans.

If Not True, Well Invented.

The *Topeka State Journal*, reciting reminiscences of Mr. Peter Teller, a veteran A., T. & S. F. engineer, says: "While pulling a party of Illinois editors and politicians in 1876, Mr. Teller averted an accident and saved the train from plunging into a torrent that had swept away the bridge, by reversing his engine and turning sand on the track, instead of jumping. The excited passengers poured out of the train and when they found the engine hanging over the brink, and realized to whom they owed their escape, the politicians at once passed resolutions thanking him, and the editors started a subscription for a watch. Three hundred and eighty dollars were raised in a few minutes and turned over to a committee to buy and engrave a watch for the faithful engineer. It is fair to the politicians to say he received their resolutions, but never received the watch, though he read in eastern papers the particulars of its presentation and his happy reply. In the winter of '74-'75 occurred the most severe snow storms known in the West. For three weeks a driving blizzard held the temperature below zero and covered the earth with many feet of snow. John Bender and John O'Rourke were snowed in between Kinsley and Dodge City for 16 days, while Mr. Teller spent 24 days in a snow drift in Eastern Colorado without turning a wheel. Charles Dyer was then the operator at Granada and headed a relief party in snow shoes for the train. They found cattle near the tracks and these Mr. Dyer killed, cooked the steaks on shovels, and served to the hungry passengers.

Across Siberia.

The first-class fare from St. Petersburg to Vladivostock, 6,677 miles, is now $125, and the journey takes from 24 to 29 days. This statement, taken from the *Novoe Vremia*, is given in a report by United States Consul W. R. Holloway, of St. Petersburg, in a report issued Sept. 19. Mr. Holloway values the rouble at 50 cents. The second-class fare is $85, and third-class $45. The westward journey takes about six days longer than the eastward, because the steamers take more time to ascend than to descend the Amur River. On the steamboats, board is a dollar a day, and on the eastern end of the railroad line dining cars are run, on which a passenger can get meals for from $1.50 to $2.50 a day. On the steamers the fares are lower even than the very low rates charged on the railroad. From Chabarovska to Blagoveschenska, 618 miles, the third-class rate is only $1.55.

German Technical Prizes.

The prizes offered in 1898 by the German Railroad Union have been awarded as follows: One of $1,800 to Herr Hagans, of Erfurt, for a locomotive with driving axles in a flexible truck; three prizes of $720 each, to Herr Breidsprecher, of Danzic, for apparatus for transferring freight cars at the Russian border (between tracks of 4 ft. 8½ in. and 5 ft. gage) without unloading; to Herr Sigle, of Essen, for a track brake; and to Herr Bräuning, of Köslin, for three publications, namely: "The Movement of Rails and Their Fastening to Wooden Ties," "Changes of Form of Rails at Joints," and one other. Seven prizes of $360 each, to Schuler, of Berlin, for a rail joint with wedge fishplates; to Schnell, of Potsdam, for a bearing spring fastening by wedges; to Prof. Barkhausen, of Hanover, Blum, of Berlin, and von Borries, of Hanover, for their work, "Railroad Engineering of the Present" (Die Eisenbahntechnik der Gegenwart); to the committee in charge of the preparation of the "History of the Railroads of Austria-Hungary," represented by Herr Strach, the editor-in-chief; to Dr. Eger, of Berlin, for three works on railroad law; to Herr von Dormus, of Vienna, for his work on "Irregular Phenomena in Steel Rail Material"; and to Dr. A. von der Leyen, of Berlin, for his work, "The Financial and Traffic Policy of the North American Railroads."

Yellow Journalism in Russia.

A German newspaper published in St. Petersburg, complains of the number of robberies and murders on Russian railroad trains, the perpetrators of which usually jump off the trains and get away safely, "though on every train there are some 15 guards, besides baggagemen and others; in all at least 20 men," who ought to be able to protect their passengers. A guard is seldom seen except when he enters a car to take the ticket of a newly-entered passenger. When there are no more than two passengers among a gang of thieves the latter run little chance of being disturbed. There is an average of something like 10 murders on trains yearly, and numerous thefts. This paper proposes that a guard should remain all night on watch in every car, which should have one door locked, so that criminals may not wander at will through the whole train to select their victims, with escape in either direction in case of alarm. It may be suspected that the newspaper which makes these statements is what we would call here a "yellow" journal, and perhaps not even quite correct as to the size of the army of employees which it credits to a Russian passenger train.

Speed of Travel in France.

The French Ministry of Public Works shows at the World's Fair a striking map which compares the rapidity of traveling at different periods. At present the journey from Paris to Calais, 183 miles, is made in 3¼ hours (56½ miles per hour). In 1692 the passenger from Paris in that time would only have reached a point 3 miles from Paris (why not walk?); in 1786 he would have gone 7¼ miles; in 1814, 13½ miles; in 1834, 20 miles; in 1867 (by rail), 120 miles; in 1887, 131 miles. Or, taking the time for the whole journey, the traveler would have been 7 days on the road in 1692, 3 days in 1786, 40 hours in 1814, 28 in 1834, 5 in 1867, and 3¼ in 1900. The fare by carriage in 1692 was about the same as the first-class fare by rail now.

The London & North Western.

We have received from Mr. Wand, General Agent in the United States for the London & North Western, the following figures of the results of working that road the half year ending June 30:

Receipts.

Passenger	$13,141,630	
Freight	18,446,626	
Rents, etc.	581,956	
Miscellaneous	904,236	
		$33,074,448

Expenditures.

Working expenses	$19,636,218	
Rents, leases	566,885	
Interest on debentures	2,614,447	
Interest 4% per annum on guaranteed and preferred stock	3,711,193	
Interest 6% per annum on consolidated stock	6,194,191	
		$32,722,934
Balance, carried forward		$351,514

(Computed £1 = $4.86.)

Passengers carried	40,902,450
Freight carried	Tons. 22,636,704
Mileage of passenger trains	Miles. 12,641,031
Mileage of freight trains	Miles. 11,229,604

Mileage worked, 1,928 miles.

Some Reflections About "Magnates."

Much speculation is going on as to the presidential succession of the Southern Pacific. . . . This calls to mind the fact that a decided change has of late years come over railroad management. Most roads have presidents, but upon studying the list of officers you will find a gentleman who has only recently figured upon the roster—"the chairman of the board." With the passing of C. P. Huntington we have seen almost the last of the one-man power in railroading. But few of the Huntington caliber are now left in the railroad business. James J. Hill, of the Great Northern, still seems to be unhampered as representative of the whole thing and a one-man power. The giant of to-day is a composite body with a "chairman of the board" as its head. The old-time railroad president was often a despot, but he was in touch with his constituents. He was recognized as the court of last resort. His successor will undoubtedly suffer from a diminished prestige; he is merely the officer on the firing line. With him things will not "go" until the "chairman" of the board" has been heard from.—*The Express*, Los Angeles, Cal.

To Complete the Guatemalan Northern.

The Government of Guatemala has accepted the proposition of the Central American Improvement Co., of which Minor C. Keith is President, and Richard Barthel Secretary and Treasurer, with headquarters at New Orleans. The road now runs from Puerto Barrios on the Gulf, southwest about 133 miles to El Rancho. An additional 60 miles is required to carry the line to Guatemala. The grades will be very heavy. The Central American Improvement Co. proposes to complete the road without concessions or subsidies of any kind save a land grant of 500,000 acres contiguous to the railroad. It guarantees to complete the line in 30 months, and has the privilege of working for 10 years, after which time the Government of Guatemala may pay to the Improvement Company $4,000,000 gold, with interest for the property. The time condition may be increased at the option of the Government.

An Incident of the Galveston Disaster.

[*From the Galveston News.*]

A piece of the trestle work of the street railroad which floated from Center street until it stopped at Thirtieth street and avenue P, was responsible for great loss of life. This monstrous structure, said an eyewitness, with its heavy timbers held together by steel rails, came floating along, with debris piled high upon it. It was 200 yards in length, and as it approached with tremendous force, it looked like a man-of-war. Steel rails protruded from the ends some 50 ft., and were swung and lashed around in the storm, demolishing everything they came in contact with. "A family floated on a raft near our house, and we begged them to come in, but they were evidently afraid that our house would go down and preferred to take their chances on the rafts. We saw several of these rafts run down and upset by the trestle work. One raft with about 25 people was struck by the great mass of timber and iron and its passengers were carried to their death. The trestle work carried away houses, rafts and everything it struck. It carried away the porch from my house and narrowly missed the house itself. I believe that this great mass of wreckage was responsible for hundreds of deaths. It is now lying in Thirtieth street, between avenues O½ and P."

Another incident, pleasant to railroad men, is found in the following, from the same paper:

Mr. Henderson, Chairman of the Transportation Committee, yesterday announced that the railroads leading out of Houston would honor no more certificates for free transportation. Mr. Henderson said: "Abundant opportunity has been given to all who desired to leave Galveston to leave on the free transportation, if they were not able to pay fare, or at half rate if able to pay. The railroad people are the best people on earth and may be depended upon in any emergency. They cheerfully came to our assistance and have carried people to all parts of the United States free of charge. We sent some people as far as New York, and the railroads made as great efforts to handle these passengers promptly and comfortably as if they were getting 3 cents a mile for each of them."

Michigan Game Laws.

The Detroit & Mackinac Railroad Company encourages a strict observance of the Michigan game and fish laws, and at the same time encourages sportsmen to travel over its line, by printing the code in brief. Copies of it may be obtained by addressing Mr. J. D. Hawks, President. The Michigan game laws have been to a considerable extent models for legislation in other States, not always followed, however, in one peculiar feature: the prohibition of interstate commerce in game.

Nicaragua Canal.

The Government of Nicaragua, in addition to removing into Western Nicaragua the cars, rails and other materials, at Ciudad America, near Greytown, belonging to the Maritime Canal Co., the concession of which was recently rescinded, has appointed an agent to control and care for all the property of the concern at that depot.

LOCOMOTIVE BUILDING.

The New York Central & Hudson River will soon order 35 locomotives.

The Dickson Locomotive Works have an order for three engines for a plantation in Java.

The Aberdeen & Asheboro has ordered one engine from the Baldwin Locomotive Works.

The Guantanamo, of Cuba, has ordered one engine from the Baldwin Locomotive Works.

The Atlantic Coast Line is having three more engines built by the Baldwin Locomotive Works.

The Delaware, Lackawanna & Western has ordered six engines from the Dickson Locomotive Works.

The Cincinnati, Hamilton & Dayton is having two engines built by the Pittsburgh Locomotive & Car Works.

The Choctaw & Memphis (Choctaw, Oklahoma & Gulf) is having five engines built by the Baldwin Locomotive Works.

The Hillside Coal & Iron Co., of Scranton, Pa., has ordered one small engine from the Dickson Locomotive Works.

The Guayaquil & Quito, a new railroad in Ecuador, is reported as about to place contracts for a number of locomotives.

The Gulf & Ship Island has ordered, from the Baldwin Locomotive Works, two consolidation engines for November delivery.

The Chicago, Burlington & Quincy will, in a few days, order 20 or 30 prairie type freight engines, to weigh about 150,000 lbs. and to have 20 in. x 24 in. cylinders.

The Intercolonial of Canada recently ordered eight heavy 10-wheel engines for fast passenger service from the Manchester Locomotive Works; 10 consolidation engines from the Richmond Locomotive & Machine Works; and six freight and one passenger engine from the Dickson Locomotive Works. The two former items were referred to in our issues of Aug. 17 and 24. The locomotives ordered from the Manchester Locomotive Works will be simple engines, weigh 145,000 lbs., with 113,000 lbs. on the driving wheels and have 20 in. x 26 in. cylinders; 68-in. driving wheels; extended wagon top type boilers with 277 charcoal iron tubes 2 in. in diam. and 13 ft. long, and a working steam pressure of 200 lbs.; fireboxes, steel, 9 ft. long and 41 in. wide; and a tender capacity for 4,500 Imp. gals. of water and eight tons of coal. The principal dimensions of the 10 consolidation engines with the Richmond Locomotive & Machine Works were given Aug. 17. All the engines will be equipped with Westinghouse brakes, Hammett bell ringers, Ster-

lingworth brake-beams, Diamond S brake shoes, Janney couplers, Hancock inspirators, U. S. Metallic piston and valve rod packings, Coale safety valves, Leach sanding devices, Detroit and Nathan sight feed lubricators, French springs and Crosby steam gages. The passenger engines will be equipped with the Safety Car Heating & Lighting Co.'s system of steam heat equipment. The make of headlights for the locomotives is undecided. Delivery of these engines is to begin in December.

CAR BUILDING.

The Chesapeake & Ohio is in the market for 600 steel cars.

The Lake Shore & Michigan Southern is figuring on some ballast cars.

The St. Louis & San Francisco is asking prices on 100 box and 50 furniture cars.

The Ohio & Little Kanawha is having one passenger car built by the Jackson & Sharp Co.

The Mexican Central has ordered from the Pullman Co. the 100 coal cars referred to Sept. 14.

The Pittsburgh & Lake Erie has ordered 10 passenger cars from the American Car & Foundry Co.

The New York Central & Hudson River has ordered 50 ballast cars from the Pressed Steel Car Co.

The Northern Pacific is reported as getting bids on some passenger cars. We have no official information.

The Guayaquil & Quito, now building in Ecuador, is said to be figuring on the necessary passenger and freight equipment for the road.

The Atchison, Topeka & Santa Fe has ordered 400 hopper bottom coal cars of 80,000 lbs. capacity from the Illinois Car & Equipment Co.

The Davenport, Rock Island & Northwestern has ordered from the Pressed Steel Car Co. the 50 coal and 25 flat cars referred to last week.

The Mather Stock Car Co. has ordered 20 stock cars from the Illinois Car & Equipment Co. They will have wooden brake-beams, Westinghouse brakes and Mather couplers.

The Peoples' Gas Light & Coke Co. has ordered six tank cars of 80,000 lbs. capacity from the Illinois Car & Equipment Co. They will have the builder's standard metal body and truck bolsters, Monarch brake-beams, Westinghouse brakes, Tower couplers, McCord journal boxes, Detroit springs, arch bar trucks and Griffin wheels.

The Baltimore & Ohio has ordered 9,000 cars, 6,000 from the Pressed Steel Car Co. and 3,000 from the Pullman Co., and is in the market for some passenger equipment. The former order calls for 4,000 flat bottom gondolas of 80,000 lbs. capacity and 2,000 self-clearing hopper bottom gondolas of 100,000 lbs. capacity. The Pullman Co.'s order is for 2,500 box cars of 60,000 lbs. capacity and 500 flat cars.

BRIDGE BUILDING.

ALLEGHENY, PA.—Local reports state that the plans for raising the tracks of the Fort Wayne R. R., and abolishing all the grade crossings in Allegheny are about settled, the grade crossing committee and the railroads having practically agreed upon all changes between the river and McClure avenue.

ARLINGTON, WASH.—The County Commissioners are asking bids for a suspension bridge across the south fork of Stillaguamish River above Arlington.

BLUE EARTH, MINN.—The Fairbault County Commissioners, on Nov. 7, will consider plans for an iron bridge over Blue Earth River.

BOSTON, MASS.—Mayor Champlin recommended, in a message to the City Council that the matter of rebuilding the bridges above the new Cambridge bridge over the Charles River receive early attention. The Brookline street bridge, Boylston street bridge, Craigie and Prison Point bridges should be rebuilt as drawless.

BRISTOL, TENN.-VA.—The city of Bristol, Va., has asked for bids on two steel girder bridges, one for Washington and the other for Williams street, both to span Beaver Creek.

BROOKVILLE, OHIO.—Bids are wanted, Oct. 20, for a bridge over a branch of Wolf Creek, at McKinley avenue. A. G. Feight, County Auditor, Dayton, Ohio.

BUFFALO, N. Y.—The City Clerk will soon want bids for a plate girder bridge across Scajaquada Creek on Delaware avenue, replacing the present span, making alterations to the piers and removing the old span. Charles F. Susdorf, City Clerk.

CATASAUQUA, PA.—The Catasauqua Bridge & Terminal Ry. proposes to build a bridge, but we are informed that no plans are made. W. L. Sims, General Manager.

CHESTER, MASS.—The town of Chester has voted to join with the Boston & Albany for a commission to abolish the grade crossings in the town, if the cost does not exceed $4,000 to the town.

CINCINNATI OHIO.—Bids are wanted, Oct. 16, by Robert Allison, President of the Board of Public Surveys, for the substructure of the bridge at Spring Grove avenue. (Sept. 28, p. 642.)

Bids are wanted, Oct. 12, for rebuilding the superstructure and approaches of Liberty street viaduct. George F. Holmes, City Clerk.

CLEVELAND, OHIO.—Bids are being received, up to Oct. 15, by George W. Kittredge, Chief Engineer of the Big Four, Cincinnati, Ohio, for the superstructure of a Scherzer rolling lift bridge to cross Cuyahoga River from the foot of South Water street. It will have one span of about 120 ft., and a 70-ft. deck plate girder. The approximate cost is $100,000. I. D. Tuttle has the contract for the substructure.

Charles P. Salem, City Auditor, informs us that the $50,000 of bridge bonds, sold on Aug. 13, is for bridge work, for which contracts have not been let.

An ordinance is introduced in the Council providing for a $300,000 bridge at Clark avenue, connecting Brooklyn and Newburg; also for a $150,000 bridge at Tod street.

DIGBY, N. S.—Reports state that plans have been made for a new traffic bridge to be built over Racquette River.

GALVESTON, TEX.—It is stated that the various railroads entering Galveston will form a company to build and operate a steel bridge across Galveston Bay to the city.

GRAFTON, W. VA.—Geo. S. Good & Co., contractors, are asking bids for replacing wooden bridges with masonry on the Grafton & Belington division of the Baltimore & Ohio R. R.

HOUSTON, TEX.—Reports state that the rise in the Colorado River swept away all bridges in the vicinity of Goldwaithe.

JACKSON, ALA.—The Alabama & Vicksburg will soon let a contract to finish the steel bridge over Pearl River, at Jackson, to cost about $50,000.

JUDSON, MINN.—The Commissioners of Blue Earth and Nicollet counties are considering building a steel bridge over the Minnesota River at Judson.

MIAMISBURG, OHIO.—Bids are asked, until Oct. 20, for a lift bridge over the Miami & Erie Canal on Central avenue. A. G. Feight, County Auditor, Dayton, Ohio. (Oct. 10, p. 544.)

MILWAUKEE, WIS.—The County Commissioners are reported to have passed a resolution to build a viaduct over the Menominee Valley west from Grand avenue. The exact location is not decided.

MINNEAPOLIS, MINN.—See other structures.

NATCHITOCHES, LA.—The Natchitoches Railway & Construction Co. has let a contract to the Alabama Bridge Co., of Decatur, Ala. (American Bridge Co.), for its proposed bridge over the Red River at Grand Ecore, at $92,000. (Aug. 17, p. 559.)

OMAHA, NEB.—We are informed, by the Union Pacific, that no definite plans have been prepared for the Twenty-fourth street viaduct, but that something may be done on the structure this fall. The contract with the city does not oblige the company to finish the viaduct this year.

OSKALOOSA, IOWA.—Bids are wanted by the Supervisors of Mahaska county, until Oct. 10, for a steel bridge over North Skunk River at Bradley's Ford, Pleasant Grove Township. J. B. Cruzen, County Auditor.

PATERSON, N. J.—At a joint meeting of the boards of Aldermen and Freeholders, City Engineer Harder was directed to prepare plans, etc., for the proposed bridge across the Passaic River near Van Houten street, connecting the Sixth and Second wards.

PITTSBURGH, PA.—H. S. Kerbaugh, of Philadelphia, who is building the foundations for the new union station, has the contract from the Pennsylvania R. R., to build 40,000 cu. yds. of masonry for the piers, abutments and foundations for elevating the Pittsburgh, Fort Wayne & Chicago R. R. tracks.

PORT HURON, MICH.—A lift bridge is proposed at Military street, replacing the present structure.

REGINA, N. W. T.—The Provincial Government is receiving bids for a bridge over Blindman River; also for a bridge over Ghost River.

The Commissioners of Public Works want bids, until Oct. 15, for bridges over Sturgeon River, Fulton's Creek and Oliver's Creek.

ROCHESTER, N. Y.—State Superintendent of Public Works Partridge has let contracts to the Havana Bridge Works for two steel lift bridges over the Erie Canal, one at Rochester for $68,528, and the other at Utica for $23,025.

ROCK ISLAND, QUE.—The Town Council, according to report, has decided to build a steel bridge replacing the old Middle bridge.

ROSSLAND, B. C.—The bridges proposed over the main Kettle River, near Grand Forks, and across the North Fork, according to report, will be built this fall.

ST. MARY'S, ONT.—Reports state that the city contemplates building a bridge over Trout Creek at Wellington street.

WILKESBARRE, PA.—The City Council is considering building a bridge over the railroad tracks near the Valley shops, connecting North Wilkesbarre with the East End.

Other Structures.

ASHLAND, OHIO.—The Ashland & Wooster R. R. will build a passenger and freight depot 180 x 50 ft. in Ashland. E. A. Miller, General Manager.

BANGOR, ME.—The Maine Central is building a 35-stall roundhouse at High Head, Bangor. Each stall will be 12 ft. wide and 72 ft. long. It will cost about $35,000.

BUENOS AYRES, ARGENTINE.—The Buenos Ayres *Herald* says that the Southern Railway of Buenos Ayres will make improvements to cost about £3,700,000. The work to be done will include the south dock on Demerichi Island and an extension to the station at the Plaza Constitucion. Five kilometers of elevated railroad in connection with the station are to be built at a cost of £50,000 per kilometer. The North and South Barracas stations will be made into one and there will be a footbridge over the Riachuelo. The Banfield workshops will cost £300,000. Las Frores will have a new station at a cost of £50,000. Improvements in Bahia Blanca port will cost £350,000. Then there is the Gruenbien & Olavarria Ry., the Neuquen Bridge, the raising of the level of the embankment in places, a large station at Tandil, the new Sola freight station and a large increase in the rolling stock.

HAMLET, N. C.—The Seaboard Air Line will build a round-house at this place.

KERN, CAL.—Reports state that the Southern Pacific will build an additional erecting shop in Kern.

MINNEAPOLIS, MINN.—The Wisconsin Central will soon begin work on the contemplated improvements at its terminals on Boom Island, to cost about $1,000,000, and include, besides track facilities, freight houses, roundhouse and machine shops, and a freight depot at the foot of Hennepin avenue. A bridge will be built from the mainland over the Mississippi River to the island.

NEW YORK, N. Y.—The plans for the iron work above the street level for the new Custom House in New York City have been approved by the Supervising Architect, Treasury Department. It is stated that drawings and specifications will be ready for bidder's estimates within a week.

PHILADELPHIA, PA.—Plans have been filed with the Bureau of Building Inspection by W. A. Hurlock & Son, for the new passenger station of the Philadelphia & Reading, which they will build at Wayne Junction. The building will be of brick, 21 x 70 ft., and cost $44,000.

PITTSBURGH, PA.—The Pittsburgh & Castle Shannon has bought 67 acres in Baldwin Township on which it is proposed to build a repair shop.

RICHMOND, VA.—The new depot built by the Southern Ry. at Richmond is finished and opened. The building is of light brick, with sandstone trimmings, and the interior finishings are in hardwood. The platform is 529 ft. long. Division offices occupy the second floor.

SIOUX CITY, IOWA.—The Union Terminal Co. will build a large warehouse for the use of Tollerton & Stetson, of Sioux City. It will be of brick, will be five stories high, 100 ft. wide by 150 ft. long, and will cost about $100,000. This is only one of several improvements this company contemplates making in Sioux City.

WACO, TEX.—Vice-President and General Manager Charles Hamilton, of the Texas Central, is reported as stating that the roundhouse and repair shops of the company, now located at Walnut Grove, about 62 miles north of Waco, will be moved to East Waco, where the company has recently bought land.

WILLIAMSVILLE, ILL.—Fire, on Sept. 25, destroyed the Chicago & Alton depot, and an elevator owned by W. H. Council.

WINNIPEG, MAN.—The City Council is again considering the plans of the Canadian Pacific for building the subway on Main street; also building a new station and hotel, the latter to cost about $1,000,000.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xi.)

St. Louis Railway Club.

At the meeting of the St. Louis Railway Club, held Sept. 14, the paper was "Transportation and Preservation of Perishable Freight," by Mr. Henry Miller, Assistant Superintendent St. L., K. & N. W. R. R. The next meeting will be held Friday, Oct. 13, at 3 p. m.

New England Railroad Club.

The next regular meeting of the Club, the first of the new season, will be held at Pierce Hall, Copley Square, Boston, Oct. 9, at 8 p. m. The subject of the evening is "Emergency, Surgical and Medical Operations," with illustrations, by Dr. Farrar Cobb, out-patient surgeon of the Massachusetts General Hospital, and by Dr. R. C. Cabot, out-patient physician of the same institution.

American Railway Association.

The Fall meeting of the American Railway Association will be held in the "Stockholders' Hall," Room No. 233, South Terminal Station, Boston, Oct. 24. Reports will be presented by the following committees: Executive, Train Rules, Car Service, Safety Appliances, Interlocking and Block Signals, and the Committee on Statistical Inquiry. Three members of the Committee on Car Service, three of the Committee on Safety Appliances, and two members of the Committee on Nominations are to be elected.

American Society of Civil Engineers.

The September *Proceedings* of this Society have appeared. This number contains a report in full of the business meeting at the thirty-second annual convention in London and of the proceedings at the reception in the library of the Institution of Civil Engineers. Here we find the text of the address of welcome by Sir Douglas Fox, a dignified and hospitable speech. We find also the remarkably graceful reply made by Col. Haines.

This copy of the *Proceedings* contains a paper of almost 200 pages on "The Theory and Practice of Precise Leveling," by Mr. David A. Molitor. It contains also a paper by Mr. Chanute on "The Preservation of Ties in Europe," and discussions on several papers which have already been published.

The Car Foremen's Association of Chicago.

The regular meeting of the Car Foremen's Association of Chicago, was held in the Monadnock Building, Thursday evening, Sept. 13, about 70 members being present. The changes in the new M. C. B. rules were presented for discussion, but as the changes were few and good they were indorsed as a whole, by the Association. In the discussion of odd material on cars, it developed that narrow shank couplers and 30-in. wheels caused the most trouble. A number of cases were cited where cars had to be held until such parts could be got from the owners. It was the opinion of some that the owners should be made to stand all the expense of maintaining "fads" on their cars, but the motion as passed included only narrow shank couplers and 30-in. wheels.

American Society of Railroad Superintendents.

The meeting of this society, which comes on Oct. 18, and which has already been announced, is to be held at the Holland House, Fifth avenue and 30th street, New York city; and the hour of meeting is 10:30 a. m. The circular of Secretary Hammond suggests that the meeting can be made more interesting, and more time be secured for discussions, if the election of officers be voted by acclamation. The arrangements for the excursion around the harbor, to visit the freight terminals, have been made with great care, and the officers of the society believe that every Superintendent will find this inspection trip of absorbing interest. The distribution of freight by water in and around New York affords one of the greatest transportation "exhibits" in the world.

The Engineers' Club of Philadelphia.

A business meeting of the Club will be held on Saturday, Oct. 6, 1900, at 8 o'clock, p. m. A communication will be presented from the Engineers' Society of Western New York requesting the co-operation of this Club in the establishment of a joint congress and engineering exhibit at the Pan-American Exposition, to be held in Buffalo, N. Y., from May 1 to Nov. 1, 1901.

A paper will be read on "Transmission of Gas and Air Through Pipes; and the Transmission of Power by Compressed Air," illustrated, by Fred W. Gordon.

A conversational meeting will be held on Saturday, Oct. 13, when some points in the history and applications of high explosives will be presented and illustrated. Good progress has been made on the work of indexing the Reference Library during the past summer. Over 740 books have been made accessible to the members by means of a card index which has been placed in the parlor.

The State Meeting, held Sept. 15, was called to order by Vice-President Henry Leffmann, at 8:25 p. m. There were 36 members and visitors present.

Mr. L. Y. Schermerhorn presented the paper of the evening on the water-jet as an aid to engineering construction. After briefly describing the method by which a powerful jet of water, directed under water at the lower end of a pile, will disintegrate the sand or mud at the

bottom and facilitate the sinking of the pile, a brief history of the use of this system was given. From this it would appear that Lieut. George B. McClellan suggested its first use, which occurred in 1852 at Matagorda Bay, Texas. The balance of the paper consisted mainly of brief descriptions of the methods of applying the water-jet in the most important engineering operations in which it has played a part. The water-jet was not recommended as a complete substitute for the driving-hammer, but as an important supplement to it in suitable locations. The use of the water-jet in making borings through earthy materials to determine their character, for stirring up mud or sand in hydraulic dredging, and its application in California in hydraulic mining, were also pointed out.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. Manjiro Kano, Locomotive Superintendent of the Hoshiu Railroad, of Japan, arrived last week from Europe, and after spending about two weeks in America, will sail from San Francisco for Japan. He will visit Niagara Falls and Chicago on his way West.

—Mr. N. V. Truly, Purchasing Agent of the New Orleans & Northwestern, has had one year of experience in railroad business, and that with his present company as Assistant Auditor. He was born in November, 1874, and had a common school education. He also attended the Eastern Business College at Poughkeepsie, N. Y., and was a bookkeeper until he began railroad work.

—Mr. Taro Hayami, representing the Hankaku and several other railroads of Japan, is making a tour of this country studying our railroad systems and visiting several of the large establishments for making railroad materials. His plan is to visit Boston, Schenectady, Albany and Philadelphia, spend one or two weeks in Pittsburgh, and go from there to San Francisco, from which place he will sail for Japan.

—Mr. Warner M. Newbold, Division Superintendent of the Louisville & Nashville, shot and killed himself at his home in Birmingham, Ala., Sept. 30. He was 50 years old, and was a native of Pennsylvania. He began his railroad career in 1864 as telegraph operator on the Camden & Amboy. In 1882 he became assistant to the General Superintendent of the Chicago & Northwestern, and two years later Division Superintendent of the Louisville & Nashville.

—Mr. D. F. Brandon, Superintendent of Bridges and Buildings of the Chattanooga Southern, was born Dec. 9, 1868. He began railroad work in 1885 as bridge carpenter, after the first three months being foreman of a bridge gang of the Nashville & Telico. He held similar positions with the West Virginia & Pittsburgh and the Chattanooga Southern until August, 1894, when he was made Foreman of Buildings with the Southern Pacific. The following year he was Foreman of Roundhouses and Buildings with the Illinois Central. He returned to the Chattanooga Southern in 1898 as Bridge Foreman, and continued in that position until this year, when he was appointed Roadmaster and again advanced to his present position of Superintendent of Bridges and Buildings in August last.

—Mr. A. H. Jones is the Superintendent of Telegraph and Trainmaster for the Toledo, St. Louis & Western, successor to the Toledo, St. Louis & Kansas City. Mr. Jones was born at Maumee, Ohio, Feb. 12, 1868. He learned telegraphy at Whitehouse, Ohio, on the Wabash R. R., in 1884 and 1885, and served the Toledo, St. Louis & Kansas City as agent at Waterville, Ohio, in the spring of 1886. Except for two years, in 1888 and 1889, when he was Train Despatcher on the Superior Division of the Chicago, Milwaukee & St. Paul at Milwaukee, Wis., he has remained continuously with the Toledo, St. Louis & Kansas City. He served as Train Despatcher, Night Chief Despatcher and Chief Despatcher until March 21, 1896, after which date he was Trainmaster of the Toledo Division. His recent appointment of Superintendent of Telegraph is in addition to these duties.

—Mr. C. J. Phillips, recently appointed General Agent of the Delaware, Lackawanna & Western in charge of the Bangor & Portland, was born near Morton, Tazewell County, Ill., Nov. 30, 1860. He began his railroad career in 1878 as a telegraph operator at Eureka, Ill., for the Toledo, Peoria & Western. The following year he was transferred to Keokuk, Ia., as ticket agent at the union station for this and other companies, and in 1880 to Centerville, Iowa, as agent for the Wabash. For four years from 1886 he was Probate Judge for the Second Judicial District of Iowa. He returned to railroad work in 1890 as Division Freight Agent for the Chicago, Rock Island & Pacific at Des Moines, Iowa, in charge of its lines in that State, which position he held until Sept. 20, this year, when his appointment to the Delaware, Lackawanna & Western took effect. Mr. Phillips was appointed Lieutenant Colonel of the Iowa National Guards by Governor Jackson in 1894, and served two years on the Governor's staff.

—Mr. George T. Jarvis, for some time Receiver and General Manager of the Louisville, Evansville & St. Louis, as already noted, has been made General Manager of the Wisconsin Central. Mr. Jarvis was born in New York in 1859, and entered railroad service in January, 1876, as an apprentice in the Renovo shops of the Pennsylvania. After serving also as a fireman, he took a course in civil engineering at the Massachusetts Institute of Technology in 1881, and in July of the following year was appointed a clerk to the Superintendent of the Middle Division of the Philadelphia & Erie. In February of 1883 he was appointed chief clerk in the Transportation Department of the Mexican Central, and was subsequently promoted to Trainmaster and then to Superintendent. He was made Superintendent of the Duluth, South Shore & Atlantic in February, 1888, and two years later Superintendent of the Ohio Division of the Baltimore & Ohio. He was called to the Lake Erie & Western in November, 1891, as Assistant General Superintendent. His appointment as Receiver and General Manager of the "Air Line" took effect in May, 1896.

—Mr. William S. Martin, General Superintendent of the Denver & Rio Grande at Denver, Colo., was born at Keokuk, Ia., in December, 1863. He entered railroad service in 1878 with the Missouri, Iowa & Nebraska at Keokuk, serving as clerk and telegraph operator and agent for about 16 months. On July 10, 1881, he took service with the Wabash, St. Louis & Pacific at Keokuk, Iowa, as operator in the freight office, and in the Despatcher's office, and then as Despatcher, and from Jan. 4, 1885, as Chief Despatcher at Centerville, Iowa. On Feb. 14, 1885, he became Chief Despatcher of the Louisville, Evansville & St. Louis, and two years later Master of Transportation on the same road. He went to the Louisville & Nashville on July 1, 1889, and continued with that company until his recent appointment, serving as Trainmaster, Assistant Superintendent of the Nashville Division, and of the Nashville, Florence & Sheffield to Oct. 1, 1891; as Superintendent of the Owensboro & Nashville to April 1, 1895; as Superintendent of the Louisville Division until Jan. 1, 1898, and as Superintendent of the Henderson & St. Louis Division until Sept. 1, 1900, the date of his recent appointment.

—Mr. J. P. O'Donnell, of London, is now in the United States on affairs connected with pneumatic tools and also with pneumatic interlocking. It is quite unnecessary to say to our readers that Mr. O'Donnell has been an eminent and successful signal engineer for a number of years. He is a member of the firm of Evans, O'Donnell & Co., in London, with signaling works at Chippenham, and was at one time concerned with the National Switch & Signal Co. as a consulting engineer, and has several times visited this country in connection with signaling matters. He is a member of the American Society of Civil Engineers, and was active on the local committee at the summer convention held in London this year. Quite recently he has organized, and put in operation a company for making and selling pneumatic tools, with works at Chippenham, and part of his business in America now is to enlarge the scope of that company. It would be out of place to say anything of his plans and negotiations, but one must appreciate the sagacity and energy with which he has seized upon one of the most important of recent industries, and we may expect as a result of his efforts an increase in the British and Continental trade in pneumatic tools in which the American makers have already been so successful.

—Mr. Charles E. Bedell was killed Friday, Sept. 28, by falling from the false work on the end span, Brooklyn side, of the New East River bridge. Mr. Bedell was an engineer who had already achieved a fine place in his profession and seemed to all of those who knew him destined to go much further. His grandfather was long associated with Peter Cooper in the glue business and his father, Mr. Edwin F. Bedell, has been the Secretary of the New Jersey Steel & Iron Co. since its foundation. Mr. Bedell was in his thirty-eighth year when he was killed. He was graduated from Yale College about 1884, and soon after entered the bridge shops of the New Jersey Steel & Iron Co., at Trenton. He also spent some time at the Durham furnaces studying the metallurgy of iron. He was local engineer for the Steel & Iron Company in New York city for several years, and during the building of the Park avenue viaduct of the New York Central & Hudson River he was Resident Engineer for the contractors. When the New Jersey Steel & Iron Company began erecting the steel towers and end spans of the New East River bridge Mr. Bedell was made Resident Engineer in charge of that work on the Brooklyn side, where he was highly successful. Throughout the work, and notably during the recent strike, he kept the confidence of his men to an unusual degree. He was a clear-headed man in all emergencies, cool and with excellent judgment and skill. He was a man of good physique, of self-restraint and dignified manner, was just in his dealings and a man of conscience and of high ideals. It is not known just how he happened to fall from the false work. He was accustomed to visit this part of the work and was always cautious. It is supposed that the heavy blocks of a derrick on the traveler swung towards him while he was standing on a narrow beam, and that in endeavoring to avoid these he lost his balance. He fell about 90 ft. to the ground and never regained consciousness, dying within a few hours. He leaves a wife and two children living at Montclair, N. J.

—Mr. H. Fernstrom, the new Chief Engineer of the St. Joseph & Grand Island, is a native of Sweden. He

was born on Jan. 26, 1857, and was educated at a technical school and the Institute of Technology at Stockholm. He practiced for four years in Sweden as apprentice, draughtsman, assistant engineer in charge of surveys and in construction of iron work and railroads. Coming to this country, he was during the year 1880 a draughtsman in an engineer's office at Boston, Mass. The following year he was instrument man and Assistant Engineer for the Minneapolis & St. Louis, and the next year held a similar position on the Minnesota Central. In 1883 he entered the service of the Minnesota & Northwestern as Locating and Assistant Engineer, and continued with that company and its successor companies, the Chicago, St. Paul & Kansas City and the Chicago Great Western, as Chief Engineer in Charge of Construction and Maintenance of Way until Aug. 1, 1900. His appointment to his present company, the St. Joseph & Grand Island, took effect Sept. 1.

ELECTIONS AND APPOINTMENTS.

Arkansas Southern.—A. Bohlinger has been appointed Assistant Superintendent.

Blackwell, Enid & Southwestern.—The following changes were made in the officers of this company, effective Sept. 25: Breckinridge Jones, of St. Louis, Mo., President; Ed. L. Peckham, General Manager, and Linton Williams, Chief Engineer, both with headquarters at Blackwell, Okla. T.

Boston & Albany.—At a recent meeting of the stockholders W. H. Barnes was elected a Director, succeeding the late Jacob C. Rogers.

Central R. R. of New Jersey.—W. B. Butterfield has been appointed General Foreman, with headquarters at Jersey City, N. J.

Chicago & Alton.—C. Skinner, heretofore Master Mechanic of the Toledo, St. Louis & Kansas City, now the Toledo, St. Louis & Western, has been appointed Master Mechanic of the C. & A., with headquarters at Slater, Mo., succeeding W. J. Bennett. J. E. May has been appointed Superintendent of Car Service, with headquarters at Bloomington, Ill., succeeding F. W. Bridges, assigned to other duties, effective Oct. 1. A. Newman, Assistant General Freight Agent at Chicago, Ill., has resigned.

Chicago & Southeastern (of Ind.)—W. S. Parkhurst, heretofore General Freight and Passenger Agent, has been appointed Auditor, succeeding R. W. Bidgood, resigned.

Chicago, Indianapolis & Louisville.—W. J. Bennett, heretofore Master Mechanic of the Chicago & Alton, at Slater, Mo., has been appointed General Foreman of the C., I. & L., with headquarters at Lafayette, Ind.

Choctaw, Oklahoma & Gulf.—G. W. Thompson, Assistant General Superintendent at Little Rock, Ark., has resigned and the position has been abolished.

Fitchburg (Boston & Maine).—At a meeting of the Directors C. T. Crocker was elected President, temporarily, succeeding E. D. Codman. These new Directors were also elected: Gordon Abbott, Frederic J. Stimson, Charles E. Ware, Robert Winsor, and M. Williams.

Great Northern (Canada).—N. J. Fraser has been appointed General Freight and Passenger Agent.

Hocking Valley.—At a meeting recently held R. Bacon, R. Steel, W. Hickox, C. Steel, T. Johnson and R. S. Warner were elected Directors.

Hardwick & Woodbury.—W. H. Fullerton has been appointed General Freight and Passenger Agent.

Illinois Central.—C. C. Robinson, heretofore Master Mechanic of the Peoria, Decatur & Evansville, has been appointed Master Mechanic of the Peoria Division on the I. C., with headquarters at Mattoon, Ill.

Lake Shore & Michigan Southern.—J. O. Bradeen, Division Master Mechanic at Elkhart, Ind., has resigned.

Missouri Pacific.—Jas. M. Herbert, heretofore Superintendent of the Grand Trunk, has been appointed Superintendent of the M. P., succeeding S. T. Shankland.

New York Central & Hudson River.—Charles H. Hogan has been appointed Master Mechanic of the Western Division, with headquarters at East Buffalo, N. Y., effective Oct. 1.

Northern Pacific.—A. E. Law, heretofore Division Superintendent at Minneapolis, Minn., has been appointed Assistant General Superintendent, with headquarters at Tacoma, Wash., succeeding W. G. Pearce, who recently became Assistant to the President.

Oregon Short Line.—J. A. Reeves has been appointed Assistant General Freight Agent.

Pennsylvania.—Theodore F. Brown, heretofore Auditor of the Allegheny Valley, has been appointed Assistant Auditor of the Union Line, a new office, with headquarters at Pittsburgh.

Philadelphia & Reading.—Frank S. Stevens has been appointed Superintendent of the Reading Division at Reading, Pa., succeeding W. G. Besler, promoted. J. E. Turk, Supervisor at Pottsville, Pa., succeeds Mr. Stevens as Division Engineer at Reading.

Savannah Union Station.—The officers of this company, referred to in the Construction column, are: President, W. W. Mackall; Vice-President, F. S. Gannon; Treasurer, J. Moultrie Lee; Secretary, W. V. Davis.

South Georgia.—E. D. Lumsden has been appointed Chief Engineer, with headquarters at Quitman, Ga., succeeding J. T. Stone, deceased. G. V. Wagner has been appointed Master Mechanic, with headquarters at Heartpine, Ga.

St. Louis Southwestern—The following new Directors have been elected: F. H. Britton, W. H. Taylor and A. Loeb.

Wilmington Seacoast.—F. H. Stedman has been elected Secretary and Treasurer.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Aberdeen & Nashville.—Building is reported begun on a branch five miles long from West End, N. C., south to Jackson Springs.

Atlantic & North Carolina.—The stockholders, on Sept. 27, voted to build the branch from La Grange, N. C., northeast about 15 miles to Snowhill. (Construction Supplement, July 27, 1900.)

Baltimore & Ohio.—A preliminary survey, said to be in the interest of this company, is reported in progress for a branch from Cherry Run, W. Va., north about 25 miles to McConnellsburg, Pa.

Boca & Loyalton.—This company was incorporated in California Sept. 24, with a capital stock of $243,000, to build a railroad from Boca, on the Southern Pacific, north about 25 miles to Loyalton. This may be the same project as the Loyalton Lumber Company's line from Loyalton south, now building. Among the stock owners are: John H. Roberts, Sacramento; William S. Lewis and Richard H. Lewis, Loyalton; P. J. Harney and Geo. E. Gates, San Francisco.

Bristol & Neshaminy.—This company waas incorporated in Pennsylvania Sept. 28, with a capital stock of $25,000, to build a line 2½ miles long in Bucks County.

Canadian Pacific.—J. D. McArthur has the general contract for the extension from West Selkirk, Man., north 22 miles toward Gimli, on Lake Winnipeg. A. C. Smith, of Winnipeg, has taken the contract for the first four miles and grading is begun. It is stated that no track will be laid this year. (Construction Supplement, July 27, 1900.)

Carolina Northern.—Contracts will be let very soon according to report, for an extension of this line from Barnesville, N. C., south to Marion, S. C. Augustus Mellier, of Bourse Bldg., Philadelphia, Pa., is President. A. L. Cumming, Lumberton, N. C., is Chief Engineer. (Construction Supplement, July 27, 1900.)

Central New England.—The second attempt is being made to obtain condemnation across the Montague farm, in the town of East Granville, Conn., for the connecting link of 313 ft. on the new Tariffville branch. The Connecticut Board of Railroad Commissioners, on July 23, approved the layout but the courts have decided that new condemnation proceedings must be begun. (Aug. 3, p. 531.)

Central Vermont.—An officer denies that the company is contemplating an extension to Rochester, Vt. (Sept. 28, p. 644.)

Chattanooga Southern.—Extensive improvements

are reported in progress between Chattanooga, Tenn., and Gadsden, Ala.

CHESTERFIELD & LANCASTER.—Building is to be begun soon, according to report, on this new line from Cheraw, S. C., on the Seaboard Air Line, to run west about 50 miles via Chesterfield and Hornsboro to Lancaster. G. J. Redfearn, of Chesterfield, S. C., is President. (Construction Supplement, July 27, 1900.)

CHICAGO, MILWAUKEE & ST. PAUL.—A plot of a change in the line at Redfield has been filed with the South Dakota Secretary of State, which provides for a loop line about two miles long which will take the road into the town.

See also Escanaba & Lake Superior under Railroad News.

CHOCTAW, OKLAHOMA & GULF.—Neely & Smith, of Chattanooga, Tenn., are reported to have begun raising the track for about two miles on the west side of the Mississippi, beginning at a point about four miles from West Memphis.

CINCINNATI, CHARLESTON & PORTSMOUTH.—The company has given a mortgage for $500,000 for the proposed extension from Charleston, Ohio, southeast 23 miles to West Union. (Construction Supplement, July 27, 1900.)

CLEVELAND, ELYRIA & WESTERN.—This company, which is a consolidation of several electric companies having an electric line across the north end of the State of Ohio, has decided to build an extension from Elyria east 17 miles via Strongsville and Brunswick to Medina. (Railroad News, June 29, p. 458.)

COLUMBUS NORTHWESTERN.—The new owners, according to report, have determined to extend the line north to Lima, Ohio, to connect with the Columbus, Lima & Milwaukee, and south to Columbus. It was recently bought by W. B. Strang, Jr., New York, and Charles N. Haskell, Ottawa, Ohio. (Railroad News, Detroit & Lima Northern, Sept. 28, p. 644.)

DAVENPORT, ROCK ISLAND & NORTHWESTERN.—The company has decided to build between Moline, Ill., and the Rock River this season. This is for the proposed extension southeast about 85 miles to Peoria. The line is owned by the American Steel & Wire Co. (Construction Supplement, July 27, 1900.)

GEORGIA ROADS.—The Gray Lumber Co., of Pinebloom, will build an extension of its line about 13¼ miles long to Nashville, Ga. The work will be done by the company.

GRAND FORKS & KETTLE RIVER.—Surveys are begun at the International boundary for this proposed line from Grand Forks, B. C., toward Republic. (Sept. 7, p. 602.)

GULF & INTERSTATE.—The company is reported to have made arrangements for rebuilding about 31 miles of its track destroyed by the recent storm.

ILLINOIS CENTRAL.—Surveys are reported completed under William Hayden for an extension from Baton Rouge, La., east 65 miles to Galveston. This extension is said to be under the title of the Louisiana, Mississippi & Alabama.

KLONDIKE MINES.—The proposed route of this line from Klondike City up Bonanza and Eldorado creeks, B. C., has been approved at Ottawa, and permission is granted to build over Crown lands along the route. (Construction Supplement, July 27, 1900.).

MARVIN CREEK.—This company was incorporated in Pennsylvania Sept. 28, with a capital stock of $25,000, to build a line 6½ miles long in McKean County.

MEXICO CITY & CLACO.—The Mexican Government has made a contract with Messrs. Enrique Torres Torrija and César F. de la Regnera, authorizing them to build a railroad from Mexico City south through Xochimilco to Claco. Surveys are to be begun at once, and plans submitted within three months. The concessionaires are required to build five kilometers the first year and five each succeeding year, completing the contract within eight years.

MINNEAPOLIS & ST. LOUIS.—An officer denies the reported proposed extension from Angus, Iowa, south. (Sept. 21, p. 628.)

MOLINE & PEORIA.—This company has been incorporated in Illinois, with a capital stock of $100,000, to build the extension of the Davenport, Rock Island & Northwestern referred to above. The directors are: Clyde A. Morrison, Herbert D. Howe, Donald H. Mann, Wilton B. Judd and Gordon J. Murray.

NASHVILLE & KNOXVILLE.—King Bros., of Monterey, Tenn., who have the contract for the branch from Monterey north about 16 miles to Hanging Limb, are ready to sublet contracts. (Sept. 21, p. 628.)

NATCHITOCHES & GRAND ECORE RAILWAY & BRIDGE.—A contract has been let for the bridge across the Red River at Grand Ecore by the Natchitoches Railway & Construction Co. This is preparatory to building a railroad. Simcoe Walmsley, of Natchitoches, La., is Secretary. (Construction Supplement, July 27, 1900.)

NEW YORK CITY RAPID TRANSIT.—The Rapid Transit Commission has decided to extend the subway from the City Hall Park south along Broadway to Bowling Green, and thence from South street under the East River to Joralemon street, Brooklyn, to the Brooklyn City Hall, and thence to Flatbush and Atlantic avenues. The estimated distance is about 4¼ miles and the cost about $6,000,000. The matter must be passed upon by the Municipal Assembly and right of way obtained before contracts can be let. (Construction Supplement, July 27, 1900.)

NEW YORK CONNECTING.—Building is begun at Bushwick Junction, L. I., for this new double-track line from the Port Townsend branch of the New York & Harlem line of the New York Central, to run southeast 7½ miles via Randall's and Ward's islands and through Astoria, L. I., to the Long Island R. R. at Bushwick Junction. It will require bridges and viaducts about three miles long. Oliver W. Barnes, 55 Broadway, New York, is the contractor. Alfred P. Boller is President and Chief Engineer. (Construction Supplement, July 27, 1900.)

NORFOLK & WESTERN.—A contract has been let for five miles of the proposed extension from Ivanhoe, Va., west about 20 miles to Speedwell in the Cripple Creek Valley. (Sept. 28, p. 644.)

A contract has also been let for a second track two miles long near Bluestone Junction, Va.

NORTH CAROLINA ROADS.—The line to be built by the Eureka Lumber Co. is to be 20 miles long, and extend from Marble into timber lands. A contract has been let for the first section of seven miles, which is to be completed this year. Charles Cushing, of Hot Springs, N. C., is Engineer. The company's headquarters are at Passaic, N. J. (Sept. 7, p. 602.)

The Apalachian Land & Lumber Co., Apalachia, N. C., has 15 miles of railroad in operation and expects to extend it further. W. W. Baggs, of Apalachia, has been appointed Superintendent. He will begin soon to lay several miles of new track. (Official.)

PENNSYLVANIA ROADS.—A railroad is projected, according to report, from the coal lands of the J. W. Ellsworth Coal Co. at Bentleyville, to Monongahela.

PHILADELPHIA & READING.—The Railroad Committee of the Camden (N. J.) City Council has recommended the adoption of an ordinance granting the Atlantic City line right to lay four additional tracks across Front street at its terminal.

PITTSBURGH, CINCINNATI, CHICAGO & ST. LOUIS.—An officer writes with reference to additional tracking on this road, that the company has just completed second track from Coshocton, Ohio, to Black Run, 23 miles, which completes the second track between Pittsburgh, Pa., and Columbus. The company is now at work on third and fourth tracks from Birmingham to Sheridan, three miles. On the Cincinnati division they have built about one mile of second track at Columbus. This is all that has been recently completed or is in progress. Future extensions of this character have not yet been formulated.

QUEEN ANNE.—The company is reported to have practically decided to build its proposed extension from Queenstown, Md., west about 18 miles to Love Point at the mouth of the Chester River. (Construction Supplement, July 27, 1900.)

READING, LANCASTER & BALTIMORE.—Building was to be begun this week on this line from Reading, Pa., south about 70 miles to New Holland, and thence to a point in Maryland, where connection will be made with a line to Perryville, at the head of Chesapeake Bay. This includes the Mohnsville & Adamstown, partially graded in 1892. D. R. Brewer & Co., 52 Broadway, New York, are interested. (Construction Supplement, July 27, 1900.)

REPUBLIC & GRAND FORKS.—This company was incorporated in Washington Sept. 19, with a capital stock of $1,000,000, to build a railroad from Republic, Wash., north to the international boundary near the town of Nelson, B. C. The incorporators are: James Robert Stratton and Thomas Patrick Coffee, Toronto, Can.; Tracey William Holland, Grand Forks, B. C.; Wyle Cooper Morris, Thomas M. Hammond and Eber C. Smith, Republic, Wash.; Henry V. Gardiner, Seattle, Wash.

SAVANNAH UNION STATION.—Organization of this company was effected Sept. 24, and the President was authorized to close the contract with the city for rights, concessions, etc. The company will build a union station and terminals at Savannah, Ga., for the Seaboard Air Line, the Plant System and the Southern. All of these companies are represented in the officers. (Aug. 10, p. 546.)

SEBASTICOOK & MOOSEHEAD.—Arrangements are reported completed for building the proposed extension from Hartland, Me., to Maine Stream Village and thence into Harmony. The Receiver is authorized to issue $40,000 bonds. (Construction Supplement, July 27, 1900.)

SHREVEPORT & RED RIVER VALLEY.—Opple & Hayes have sublet six miles of their contract to J. N. Adams & Son, of Denison, Tex. It includes 2¼ miles from Pineville, on the Red River, to the crossing of the St. Louis, Iron Mountain & Southern, and 3¼ miles from Bayou Rigolet toward Shreveport. (Sept. 21, p. 628.)

SOUTHERN.—Building is to be begun at once, according to report, on a branch of about 1½ miles to the Elk Valley Coal & Iron Company's mines in Tennessee.

SOUTHERN PACIFIC.—The company has completed its track to Virignia Point, Tex., and has resumed train service into Galveston. Twenty-one miles of line was destroyed in recent floods between Galveston and Houston.

SUBURBAN SERVICE.—This company has been incorporated in Illinois, with a capital stock of $100,000, to build a railroad in Knox, Henry, Rock Island, Mercer and Peoria counties. The law firm of Pam, Glennon & Calhoun, of Chicago, is interested.

TENNESSEE & NORTH CAROLINA.—Building is to be begun soon, according to report, on this line from Newport, Tenn., southeast about 20 miles down Big Pigeon River to timber land in Haywood County, N. C., and thence to Waynesville. M. P. Walker, of Waynesville, is interested. (Construction Supplement, July 27, 1900.)

TENNESSEE ROADS.—Track laying is reported begun on a narrow gage line which W. G. McCain is building from his lumber plant at Neva to timber lands at the foot of Stone Mountain.

TILSONBURG, LAKE ERIE & PACIFIC.—Surveys are reported in progress under Bell & McCubbin, of St. Thomas, Ont., for the proposed extension from Tilsonburg, Ont., north 28 miles, via Ingersoll, to a connection with the Canadian Pacific at Woodstock. (Construction Supplement, July 27, 1900.)

WASHINGTON & POTOMAC.—This company, on Sept. 26, filed new articles of incorporation to extend its line from Mechanicsville, Md., south to Point Lookout, on Chesapeake Bay, and from Brandywine, north to Washington, D. C., making a total of 80 miles, including 21 miles already completed. Charles Collier, one of the purchasers of the old property, is among the incorporators. (Construction Supplement, July 27, 1900.)

GENERAL RAILROAD NEWS.

BALTIMORE & OHIO.—Subscribers to the new common stock, issued last April at $80 per share, and on which $10 per share was paid, are notified that they will receive the voting trust certificates of the stock upon completing the payment of $70 per share. (April 20, p. 264.)

BOSTON & ALBANY.—The stockholders, on Sept. 26, voted to accept the lease of this property to the New York Central. It is stated that the property will be taken over about Nov. 17. (July 27, p. 518.)

BRITISH YUKON (WHITE PASS & YUKON).—A meeting of the stockholders has been called at Ottawa for Oct. 22, to authorize the issue of bonds, debentures or other securities for £6,000 per mile on the completed line from Lake Bennett north to the White Horse Rapids.

CENTRAL MASSACHUSETTS.—Application has been made to the Massachusetts Railroad Commissioners for a hearing to fix the value of the common stock of the road under the bill which authorized the Boston & Maine to buy the property. (July 20, p. 502.)

CHICAGO, ROCK ISLAND & PACIFIC.—The New York Stock Exchange has listed $1,000,000 additional general mortgage 4s of 1898, of which $404,205 has been expended for real estate for improvements at various points, and $293,908 for elevating the tracks in Chicago.

CORNWALL & LEBANON.—Thirteen car trust certificates for $1,000 each have been drawn for payment at the office of the trustee, the Pennsylvania Company, for insurance on lives and granting annuities, in Philadelphia, on Oct. 1. (April 6, p. 228.)

CUMBERLAND & OHIO.—The bondholders of the Northern Division, who recently obtained a verdict for $90,000 against the Louisville & Nashville, have obtained another verdict for $25,000 against the same company for depreciation of their property while being operated by the L. & N. under a lease. Another suit for $150,000 for interest on bonds, not covered by the first suit, is soon to be tried. (June 15, p. 408.)

ESCANABA & LAKE SUPERIOR.—An officer of the Chicago, Milwaukee & St. Paul writes that his company has perfected running arrangements with the Escanaba & Lake Superior and will use that line from Channing, Mich., to Escanaba. In Escanaba the St. Paul is building a yard and ore docks. (March 23, p. 195.)

FITCHBURG.—The stockholders, on Sept. 26, authorized the issue of not to exceed $500,000 3½ per cent. 20-year bonds, dated Oct. 1, 1900, to replace a similar issue of 5 per cents maturing on that date. The new bonds have been authorized by the Railroad Commissioners and were sold to Vermilye & Co., New York, Aug. 13.

GREAT NORTHERN (CANADA).—This company and the Lower Laurentian, formerly the Quebec & Lake St. John, have given notice that an agreement for the sale of the Lower Laurentian to the Great Northern has been assented to by the stockholders of both companies, and that the sale has been effected.

A meeting of the shareholders of the Great Northern is called for Oct. 16 to authorize the issue of mortgage bonds not to exceed $200,000, on the terminal property in the city of Quebec. (May 18, p. 330.)

ILLINOIS CENTRAL.—The stockholders, on Sept. 26, authorized the purchase of the St. Louis, Peoria & Northern from Springfield, Ill., to East St. Louis, and the issuing thereon of 3 per cent. mortgage gold bonds, payable in 1951, to an amount not to exceed $4,000,000. (Sept. 21, p. 628.)

IOWA CENTRAL.—The New York Stock Exchange has listed an additional $300,000 first mortgage 5 per cent. bonds of 1938, the proceeds of which will be applied to the purchase of new equipment and for extraordinary improvements.

KANSAS CITY, FORT SCOTT & MEMPHIS.—Fort Scott, Southeastern & Memphis 7 per cent. bonds to the face value of $35,000, and Short Creek & Joplin 7 per cents, with a face value of $14,000, have been drawn for payment after Sept. 26 at 105. (Sept. 29, 1899, p. 686.)

MAINE CENTRAL.—The $441,500 6s and coupons, due Oct. 1, will be paid by the Boston Safe Deposit & Trust Co., Boston, or at the company's office in Portland, Me. (July 6, p. 472.)

SEABOARD AIR LINE.—Thomas F. Ryan, of New York, has entered a new suit protesting against the reorganization of this company's property. He will test the validity of the recent mortgage given by the S. A. L. to the Continental Trust Co., New York. A decision is expected from Judge Waddell, at Norfolk, Va., on Oct. 18. (July 13, p. 488.)

The company has sold $2,000,000 2-year 5 per cent. gold bonds, secured by a collateral deposit of $4,000,000 S. A. L. first mortgage 4 per cent. bonds, and guaranteed by the Raleigh & Gaston and the Raleigh & Augusta Air Line. The issue is to pay for extensions, terminals, rails and equipment, and is to be retired at maturity by the sale of first mortgage bonds.

ST. LOUIS SOUTHWESTERN.—Last year's short cotton crop materially reduced the revenues of the southern and southwestern lines from a profitable class of freight, but it is interesting to note in the annual reports of these companies as they come to hand, how they have been able to more than make up this loss and show larger gross revenue. Cotton, for instance, ordinarily forms about 10 per cent. of the tonnage of this company (17 per cent. including cottonseed products), and more than that proportion of its gross receipts, being the largest class of freight carried except lumber, which is about half the total tonnage. The loss of 29 per cent. in cotton tonnage reported last year was, therefore, a serious one, the loss of revenue being estimated at $225,000. Nevertheless, the decrease in freight earnings is only $25,130, and the gross shows a gain of $45,946. In the two previous years the enhancement in gross receipts was $1,120,000, or about 30 per cent., as compared with 1897 figures. The company was able to decrease working charges, despite an increase of $103,000 in betterments included in operating expenses, and the net revenue was $1,752,211, gross having been $5,908,300. The balance over all fixed charges was $630,300, out of which was paid 4 per cent. interest on the second mortgage income bonds, against 2 per cent. last year. This year's payment was the first full interest ever paid on this bond issue. The proportion of operating expenses has decreased from 81½ to 70⅛ per cent., chiefly due to improved economy of transportation service. Ton miles increased about 27 per cent., but the freight train mileage was 55,000 miles less last year than in 1897. Since 1897 the company has reduced the proportion of empty car mileage to the total from 28 per cent to 23¾ per cent., increased the number of loaded cars per train by two, the load per loaded car by 2.6 tons and the average train load from 150 tons to 208 tons.

ST. PAUL & DULUTH.—A contract has been entered into between the Northern Pacific and the State of Minnesota, by which the company, in consideration of the dismissal of the action brought by the State over its absorption by the St. Paul & Duluth, agrees to forever maintain that line in all respects as if it still remained a separate interest. (Sept. 21, p. 628.)

TEXAS & PACIFIC.—Holders of first mortgage Eastern Division bonds, dated May 15, 1875, are notified that 118 bonds for $1,000 each have been drawn for payment March 1, 1901, at the Mercantile Trust Co., New York. (Oct. 13, 1899, p. 720.)

WISCONSIN, MICHIGAN & NORTHERN.—John R. Walsh, of Chicago, has made an offer to buy this property.